Biomedical Engineering Program

University of Arizona

Graduate Handbook

July 2009

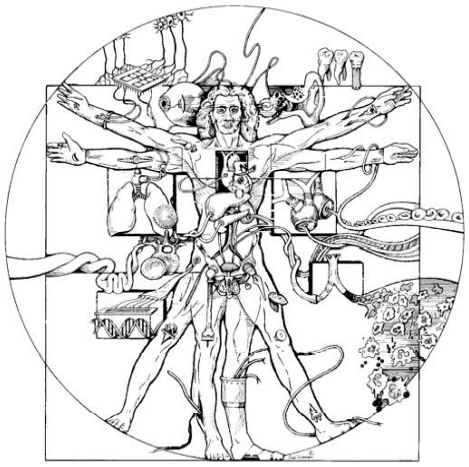

TABLE OF CONTENTS

TABLE OF CONTENTS

APPENDIX

INTRODUCTION

Welcome to the Graduate Interdisciplinary Program (GIDP) in Biomedical Engineering (BME). The purpose of this handbook is to introduce you to the various requirements that must be met before you are granted the Master of Science (M.S.) Degree or the Doctor of Philosophy (Ph.D.) degree from the Graduate College of The University of Arizona. The strength of the Biomedical Engineering Program derives largely from the flexibility afforded by the interdisciplinary faculty who participate in the Program. This allows each student the freedom to design a unique program of study to meet individual career goals.

However, the flexibility of this Program necessitates careful coordination of your program of study with your mentor, the Program Committee, the Biomedical Engineering Program Office, and the Graduate College. This handbook should be read upon entering the Program, and used, henceforth, in conjunction with the UA Graduate Catalog, as a reference regarding the policies and procedures of the Biomedical Engineering Program, at The University of Arizona.

The Program is intended to provide the foundation for a career in Biomedical Engineering. To achieve this, the student requires (a) an appropriate base knowledge of life sciences at the molecular, cellular, organ, and systems level, (b) an appropriate base knowledge of an engineering specialty at the graduate level, (c) experience and training in research, culminating in a major research project, and (d) opportunities in teaching, and experience in presenting research findings.

The Program is designed for completion of the M.S. degree in about two years and the Ph.D. degree in about five years. Obtaining the Ph.D. degree, within this time frame, depends, in large part, on the motivation and self-discipline of the student. The Program is designed to introduce students to research activities during their first year. By design, the course work requirements are flexible so that the needs of students with diverse areas of specialization can be accommodated. The student, in conjunction with a mentor, and the Biomedical Engineering Program Committee, designs the individualized program of study.

PROGRAM REQUIREMENTS

General

At the University of Arizona, the Graduate College sets the overall framework for the completion of the masters and doctoral degree. Within these guidelines, the Biomedical Engineering Program establishes specific requirements and monitors student progress. The overall goals of these requirements are to ensure:

- breadth of knowledge in Biomedical Engineering
- depth of knowledge in the student's area of specialty
- rigorous research training
- training in career skills (writing, speaking, critical evaluation of the literature)
- opportunities for training in teaching skills
- exposure to employment opportunities in academic and industrial environments

In addition, the guidelines and requirements that are described in this handbook have been established to ensure the protection of student interests and successful completion of the master's or doctoral degree.

Admission Criteria

A Bachelor's degree in engineering, physical or life sciences, or mathematics will be required for admission to the program. Calculus I and II, ordinary differential equations, and at least one course in life science are normally required for admission. All applicants must submit scores from the Graduate Record Examination (GRE) general test or TOEFL exam for international students.

Graduate College Degree Requirements

Students are expected to comply with the regulations of the Graduate College with respect to residence, credit hour requirements, and the qualifying and comprehensive examinations (please refer to the Graduate Catalog). A high level of performance is expected of students who are enrolled in graduate programs at The University of Arizona. Students must maintain a grade point average of 3.00 (letter grade of B) or better to continue enrollment in the degree-granting program, receive financial support, and to be awarded an M.S. or Ph.D. degree.

BME considers full-time enrollment for funded students to be 12 graduate units per semester for their first two semesters of enrollment. After that, full-time required enrollment will be 9 graduate units per semester, until all graded coursework is completed. At that point, students must enroll in 6 credit hours per semester until completed.

Graduate College regulations will determine the minimum hours of graded coursework required. See Graduate College for current rules (http://grad.arizona.edu/).

Faculty and Student Preceptors

A BME faculty member and a student will be assigned as preceptors for each first year student. It is expected that both preceptors be available to guide the first year student through the processes of selecting classes and lab rotations appropriate to the student's research interests, and to answer questions the student may have regarding the program. Preceptors are required to attend the BME Student Orientation, in August, as well as the Welcome Back Event.

It is recommended that the faculty preceptor meet with the student at least once a semester, and that the student preceptor and the first year student communicate during monthly student meetings. E-mail is

strongly recommended for additional communication and when face-to-face meetings cannot be organized. Both student and faculty preceptors should read through the BME Student Handbook to ensure that they are up-to-date on policies and procedures.

Ph.D. Program

Doctoral students must complete a minimum of 68 units of graduate credit, and meet the Graduate College's minimum units of courses in which regular grades (A, B) have been earned. Requirements include 15 units of the core BME courses; 15 units in the major; a minimum of 9 units in the minor; all required seminar and student forum courses (6 units of which count towards degree requirements); 2 units in a BME approved ethics course; 3 units of laboratory rotations (BME 597G) and 18 units of BME 920 (dissertation). Courses will include graduate engineering, life or physical sciences, or mathematics courses that focus on the student's biomedical engineering research interests according to the student's plan of study. A Plan of Study should be developed by the student and mentor and a copy of the written plan, along with a one-paragraph summary of the proposed dissertation research area and a listing of the proposed comprehensive examination and doctoral defense committee members, shall be sent to the BME Program office for review and approval by the Program Committee no later than the end of the third semester. If the student and mentor decide to alter the Plan of Study, an amended plan shall be submitted to the Program Committee for approval. Please see the BME Program Coordinator for details on developing and submitting the Plan of Study.

Ph.D. students entering the program prior to Fall 2006 were required to take 1 unit of a BME approved ethics course. Students prior to Fall 2007 were required to take a total of 6 units of BME forum and seminar. Students prior to Fall 2008 took four core courses (BME 510, 511, 516, 517).

During the course of study, the student must pass the Qualifying Exam (to continue in the Ph. D. program), the Comprehensive Exam, and a Final Exam (dissertation defense).

After completion of the required credits, a student in the Ph.D. program may wish to obtain the M.S. degree. Refer to Master of Science section of this handbook for the M.S. Program.

Transfer Credits

In some cases, certain degree requirements may be waived if equivalent course work has been completed previously. Please see Graduate College policies for transferring credits. Once Graduate College policies have been followed, the BME Program Committee will review requests and make decisions about course acceptance. Please contact the BME Program Coordinator for more information.

Qualifying Exam (revised November 11, 1999)

Continuation in the Ph.D. program requires that the student pass required core BME classes with a grade of B or better. If the student receives a grade below a "B" in a 500 level core course, the program committee will develop, with the student and course coordinator, a remedial plan which will be completed prior to continuing the Ph.D. program.

If students have taken any of the core courses at the 400 level and received a grade of B or better, they are required to meet with the course instructor to complete the 500 level course requirements. The corresponding 500 level course may not be taken to fulfill BME degree units. If a grade less than "B" was received at the 400 level, the student must take the corresponding 500 level course.

In all cases, the program committee will assess the student's written and oral communication skills and abilities by examining their Qualifying Examination Worksheet. After reviewing the grades and

worksheet, the student may be required to submit additional written work or take other courses before a decision can be made. After evaluating the additional work, then a final decision of continuation will be made.

Plan of Study

A Plan of Study should be developed after passing the BME core courses and entering the Ph.D. program. This should be done in conjunction with the Mentor, at the beginning of the second year in residence in the program. This Plan of Study identifies courses to be transferred (if any) from other institutions, courses completed at the University of Arizona to be applied toward the Ph.D., and any additional courses that may be needed to fulfill the requirements for the Ph.D. degree. In addition, students must submit a one-paragraph summary of the proposed dissertation research area and a listing of the proposed comprehensive examination committee members. The student's advisor/mentor, the BME Program Committee, and the Chair of the Biomedical Engineering Program must approve the Plan of Study, in turn, prior to submission to the BME Program Coordinator, who will submit it to the Graduate College.

Selection of Mentor

Each student should select a mentor no later than the end of the second semester in the program. A mentor is a BME IDP (Interdisciplinary Program) faculty member who will serve as an advisor, supporter, tutor, and role model. A mentor is expected to interact with the student on a regular basis providing guidance, advice, and the intellectual challenge necessary for the student to complete the degree program. Except in the case of self-funded master's students, the student is expected to work with the mentor and the BME Program to identify the source of the student's financial support after the initial year. The BME major advisor (mentor) cannot serve as the student's advisor for a non-BME minor.

The following suggestions may be of assistance to graduate students in choosing a mentor. There are two broad areas that come into play when choosing a mentor. The first area has a professional basis and the second a personal basis. The choice of a mentor may be the single most important decision made during graduate training. When considering the professional aspects of your selection of a mentor, the following questions may prove helpful:

1) What is this individual's reputation outside the University? Remember, when you have completed your dissertation and you are looking for a position, your mentor's reputation will initially be your reputation.
2) Does your prospective mentor have the funding available to support your research and stipend for at least four years? This area is probably the most problematic for graduate students. The money needed to fund your research project will most likely come from your mentor's laboratory. Therefore, you will need to know not only the amount of money available but also the stability of funding.
3) How does your prospective mentor's lab operate? You should critically evaluate the day-to-day operations of the lab and understand the goals of the lab and where you will "fit in". You should also understand the role of your mentor in those operations. Some principal investigators have lab managers or research assistants who run the laboratory. You should know almost as much about these individuals as about your prospective mentor.
4) What are the professional requirements of the prospective mentor on such issues as work habits, ethics, sharing of ideas, lab meetings, journal clubs, and authorship on papers?

On the personal side, the answers to the following questions may be extremely helpful:

1) Is the personality of my prospective mentor compatible with my own?
2) Is this individual going to be responsive to my needs and, just as important, am I going to be

responsive to his or her needs? When you join a lab, your mentor will have certain expectations of you, and these should be identified when evaluating a prospective mentor. By the same token, what are your expectations of a mentor?

3) What do other students and faculty think about your prospective mentor? The collegial relationship of your prospective mentor with others will influence your interaction with other laboratories.

Do not forget the importance of the choice of a mentor, and do not make that choice without a great deal of thought. Talk to other people (including the mentor's, previous students, and alumni of the program) about your prospective mentor and ask probing, but not inflammatory, questions. Provide yourself with honest answers to both the professional and personal aspects of your decision. Laboratory rotations are an excellent way to learn more about prospective mentors and labs, and can provide opportunities to answer these questions before choosing a mentor.

Once you have identified a mentor, you and your mentor should inform the BME Program of this selection in writing. The letter should indicate that the professor has agreed to serve as your advisor for your graduate studies; they will endeavor to ensure that you have financial support during your tenure as a graduate student and that you complete the requirements for the masters or doctoral degree in a timely fashion. It should be signed by both the student and faculty member and submitted to the BME Program Coordinator (See Appendix for sample letter).

The Comprehensive Examination

The objectives of the comprehensive exam are:

- to determine whether the student has attained an adequate breadth of knowledge in Biomedical Engineering,
- to determine whether the student has attained a sufficient depth of knowledge in life sciences appropriate for biomedical engineering,
- to determine whether the student has attained a sufficient depth of knowledge in a special area of engineering appropriate for biomedical engineering,
- to assess the student's ability to think clearly and independently about topics in Biomedical Engineering and to express these thoughts orally and in writing,
- to satisfy graduate college requirements,
- and to test knowledge in subjects covered by core BME courses.

As required by the Graduate College Degree Certification Office, the Comprehensive Examination has two parts, one written and one oral. As a standard of successful performance, the examining committee will determine whether the student has demonstrated the professional level of knowledge expected of a junior academic colleague. The written and oral portions of the Comprehensive Examination are to take place within two successive semesters, not including summer sessions. Students must pass the written examination and results must be reported to the Graduate Degree Certification Office before the oral examination is held. The Comprehensive Examination is to be held when essentially all core course (BME core courses) work has been completed. The Biomedical Engineering Program requires that both parts of the Comprehensive Examination must be completed by the end of the fifth semester in the BME Program. However, students are encouraged to take the Comprehensive Examination as early as their fourth semester. Exceptions may be granted in unusual circumstances by petitioning the Program Committee in advance of the deadline. A failure to meet this deadline will constitute grounds for withdrawal of financial support from the Program, due to the lack of progress towards the Ph.D. degree.

If a student does not pass the first attempt at the written portion of the examination, the examining committee may recommend that one second examination be allowed. The second examination, if approved, must take place at least three months from the first attempt, and no later than the following semester, not including summer sessions. A second attempt to pass the Oral Comprehensive Examination will be allowed upon the recommendation of the examining committee. If a reexamination is recommended, the committee members must be the same as those present at the first examination. If changes are made in the composition of the examination committee, the Dean of the Graduate College must approve them prior to the examination. The second examination, if approved, must take place no later than the following semester, not including summer sessions.

Comprehensive Examination Committee

It is the responsibility of the student to:

a) Select your Comprehensive Examination committee in consultation with your mentor. The committee should consist of at least five faculty members. See current Graduate College requirements for tenure/tenure eligible status requirements for exam committee members. Each member should be able to supply at least one question from a core BME course area to cover the five core courses as well as the student's chosen area of specialty for a total of 6 questions. Each member will grade the question(s) they pose to the student.
b) Submit the names of the proposed Comprehensive Examination Committee members to the Program Subcommittee (via the BME Program Coordinator) for approval, along with the plan of

study.

c) Schedule the examination with the committee members and schedule a room in which to take the exam;
d) Provide your committee with your plan of study, including all of the courses that will be used to fulfill your degree requirements;
e) Obtain signatures from all of the Comprehensive Committee members, prior to your oral examination (needed for the "Application for Comprehensive Oral Examination" form). Students are encouraged to meet with the exam committee frequently and to discuss the possible scope of questions with them before the examination.

The Chair of the Comprehensive Examination Committee (to be chosen from the committee, by the committee itself) is responsible for collecting the proposed examination questions, forwarding them to the BME Program Coordinator at least 2 weeks prior to the exam, distributing the questions to the student, and returning copies of the completed examination to the student and the other members of the Examination Committee. During the oral examination, the Chair of the Comprehensive Examination Committee determines the agenda and directs the questioning.

Content of the Written Portion of the Comprehensive Examination

The written examination will be six hours in length (2 sessions of 3 hours each, on 2 consecutive days) and will be based on materials covered in courses in the student's plan of study, primarily core course work. Six questions will be posed by the examiners; 1 day will consist of 3 life science questions, and the other day 3 engineering questions. A copy of each question and an outline of the solution will be submitted to the BME Program Coordinator for review 2 weeks prior to the exam. The student will be required to submit answers to 4 of the 6 questions. The two unanswered questions will be the first questions presented during the Oral Examination. Students are encouraged to meet with the exam committee frequently while preparing for the exam, and to discuss the possible scope of questions with them prior to the examination.

Each of the student's written examination answers will be evaluated by the committee member who wrote the question. The examination committee shall determine whether the student has passed the examination. Each of the questions will be graded on a 100 point scale. A score of less than 60/100 is a "fail". The student cannot fail more than one out of the four answered questions, and the average of all four of the answered questions must be 70 or higher (a sum of 280 points out of 400 total). The student's answers, with written comments, should be returned to the student within 3 business days after the student completes the examination. A copy of the student's answers to all questions should be given to each examination committee member, and a copy kept by the BME Program Coordinator in the student's file. If a student fails the examination, the examination committee will advise the student on his/her deficiencies, and the written examination must be taken during the following semester for a second and final time. The second written examination attempt must take place at least 3 months after the first attempt.

Scheduling of Oral Comprehensive Exam

BME does not encourage students to take their oral comprehensive exam in the summer, however, if the student chooses to do so, they must enroll and pay for one unit of summer school.

As of spring 2009, the Graduate College is no longer involved in the scheduling of the Oral Comprehensive Examination. The 'Application for Oral Comprehensive Examination for Doctoral Candidacy' form will be replaced by the 'Results of Oral Comprehensive Exam for Doctoral Candidacy'. The student will be responsible for going online and filling out the new form. The student will take it to their Department (BME Program Coordinator) to have the *Results of Written Examination*

section completed. The student will then take the form to the exam where the committee will record the results and provide the requested signatures. A representative of the committee will bring the form to the Graduate College at Admin 316 within 24 business hours of the exam.

Please review the current Graduate College policies in regards to the Oral Comprehensive Examination.

Content of the Oral Portion of the Comprehensive Examination

The oral examination is intended to assess the student's general knowledge in Biomedical Engineering at the level of the core BME courses, and to examine the student in more detail in those areas pertinent to the student's Plan of Study. As mentioned in the written examination section, the 2 questions not answered on the written exam will be the first 2 questions presented at the oral exam. The examination will last not more than 3 hours. Students are encouraged to meet with the exam committee frequently while preparing for the oral exam, and to discuss the possible scope of questions with them prior to the examination. Students in the past have scheduled practice or mock oral exams with peers who have completed exams, to practice the format and style of the oral examination.

Advancement to Candidacy

After successful completion of the written and oral portions of the Comprehensive Exam, the student is eligible for advancement to degree candidacy, and must complete the "Committee Appointment Form" (formerly called the Advancement to Candidacy Form) from the Graduate College. This form must be completed and signed by your dissertation chair, as well as the appropriate Dept. Head/Program Chair of the minor area of study. Please review current Graduate College policy for details of completing this form. The form should be submitted to the BME Program Coordinator, who will obtain the BME program chair's signature and submit to the Graduate College.

Selection of the Dissertation Committee

The composition of the Comprehensive Exam Committee and the Dissertation Research Committee can be the same, but is often different. The requirements regarding tenure and tenure-eligible status for Dissertation Committee members are the same as those for the Comprehensive Exam Committee. See current Graduate College polices for details of the criteria for composition of the Dissertation committee.

The Student must meet with the dissertation committee at least once per year, beginning within one year of the approval of their Plan of Study, to allow an evaluation of progress and to receive feedback.

External Reviewer

It may be appropriate that an external reviewer be appointed to the dissertation committee. Most often this person is from outside the University of Arizona. However, if circumstances warrant, this person could be from within the University of Arizona. The concept of having an External Reviewer is to add strength and expertise to the Committee that may not exist within the University of Arizona. If an External Reviewer is chosen, it is strongly recommended that this occur early to allow this person to make significant contribution to the student's graduate program. It is expected that the mentor cover any and all costs incurred in the participation by the External Reviewer. This external reviewer is not a voting member of the student's committee (unless the student petitions the Graduate College for an exception as noted above).

Final Oral (Dissertation Defense) Examination

The final examination is your dissertation defense. The "Announcement of Final Oral Examination" form is submitted to the Graduate Degree Certification Office at least 7 working days prior to the exam (defense) date. The form must be signed by all the dissertation committee members and the student is

responsible for obtaining all signatures. The form should then be delivered to the BME Program Coordinator who will obtain the BME Program Chair's signature and submit to the Graduate College. Doctoral students are required to attend the weekly BME seminar and present their dissertation research during the last year in the program.

Penultimate Draft of Dissertation

Submit copies of the draft of your dissertation document to your committee. Make sure you allow adequate time for your committee to review and for you to prepare the final version. The final version must be submitted to the Graduate Degree Certification Office at least two weeks prior to the Library deadline. For information regarding the preparation of the dissertation, see the graduate college website for document samples and templates.

Final Copies of Dissertation Document

Please see the Graduate College for current requirements of microfilming and archiving of the final dissertation. Also, be aware of requirements of a letter from the Human/Animal Subjects Committee (IRB or IACUC) if work in included in your dissertation project was subject to such a review.

One final printed copy of the final dissertation (preferably bound) is to be delivered to the BME Program Coordinator.

Please check with the Graduate College for appropriate dates and deadlines for submission of dissertation documents and forms for a particular semester.

Minor In Biomedical Engineering (Ph. D. Students Only)

The Graduate College requires all Ph.D. students to complete a "minor" program of study. Ph.D. candidates in other disciplines may select a minor in Biomedical Engineering. Effective Fall 2008, the doctoral minor is 12 units: 9 units of approved BME core courses (BME 510, 511, and one of 516, 566, 586, or 561), and 3 units of either Research methods in Biomedical Engineering (lab rotations) or BME Independent Study. Completion of these courses with a "B" average for the required units is necessary for granting of the minor. While BME participation in the Comprehensive Examination of the major program is not required, the student's dissertation (doctoral final oral examination) committee must contain one faculty BME IDP member. The BME Program should receive a copy of the student's Doctoral Plan of Study at the time they declare their minor in BME. The student's non-BME major advisor (mentor) cannot serve as the student's advisor for a BME minor.

A BME doctoral student may choose to major and minor in Biomedical Engineering, i.e. obtain a "Distributed Minor in Biomedical Engineering". The distributed minor consists of 12 units of formal graded course work in any area of Biomedical Engineering (excluding major course work, seminars, and lab rotations).

Master of Science (MS) Program

All master's students in the program must take a minimum of 38 units of graduate credit including the following courses:(a) five Biomedical Engineering core courses; (b) 2 units of a BME approved ethics course; (c) BME seminar and student forum every semester offered, but only four units will count towards the degree; (d) 2 units of Research methods in Biomedical Engineering (lab rotations); (e) 9 units in graduate engineering, life or physical sciences, or mathematics courses; and (f) 6 units of BME Thesis; and (g) remaining units which may be chosen by the student to supplement their plan of study. A final thesis defense is required.

The units of (e) and (g) will focus on the student's biomedical engineering research interests such that the courses complement and broaden the student's undergraduate degree and provide the student with the skills necessary to complete the research. The courses will be established in consultation with the student's mentor and Thesis committee. The courses chosen should be based on the student's area of specialization (see Appendix for a partial list of courses). The student and mentor should develop a Plan of Study for the MS degree as soon as possible. A copy of the written plan shall be submitted to the Program Committee for review and approval, along with a one-page summary of the proposed thesis (background/significance and aims/objectives) and a listing of the proposed Thesis committee members, no later than the end of March of the first year. If the student and mentor alter the original goals, an amended plan of study shall be submitted to the Program Committee for approval.

Master's students entering the program prior to Fall 2006 were required to take 1 unit of a BME approved ethics course. Students prior to Fall 2007 were required to take 2 units of BME forum and seminar. Students prior to Fall 2008 took four core courses (BME 510, 511, 516, 517).

The format for the thesis shall follow the instructions specified by the Graduate College. Students shall complete 6 units of BME Thesis and perform original laboratory research. A complete draft of the thesis should be delivered to all members of the student's graduate committee no later than 3 weeks prior to the anticipated MS defense date. After successful defense and final editing of the thesis as per instructions from the student's committee at the defense, the student is required to submit one bound copy of the thesis to the BME program. Please see the Graduate College for requirements of microfilming and archiving of thesis.

In certain circumstances a mentor may suggest a Master's report. In this case, please see the BME Program Coordinator or Program Chair to discuss.

<u>Transfer Credits</u>

In some cases, certain degree requirements may be waived if equivalent course work has been completed previously. Please see Graduate College policies for transferring credits. Once Graduate College policies have been followed, the BME Program Committee will review requests and make decisions about course acceptance. Please contact the BME Program Coordinator for more information.

PROGRAM TIMELINE:

The following is the general time frame in which students are expected to progress through the program in Biomedical Engineering. Typical grids of course work are included at the end of this handbook. Receipt of program funds is contingent upon satisfactory progress along and adherence to the timeline; requests for time extensions may be submitted to the Program Committee.

YEAR 1

Complete BME 510, 511, 517, two of three bio-emphasis courses (BME 566 – Biomechanics; BME 516 – Bio-imaging; or BME 561 or 586 – both Biomaterials), and BME 595B (Ethics) with a grade of "B" or better and demonstrate satisfactory mastery of written and oral communication skills, to pass the Ph.D. qualifying exam.

Begin laboratory rotations BME 597G with the goal of choosing a faculty mentor and research project by the end of this year.

Attend mid-year meeting with program chair.

By the end of your first (M.S. students) or second (Ph.D. students) semester, you should have chosen a mentor from the Biomedical Engineering faculty. To formalize your selection, you and your mentor must submit a letter, indicating your choice and your mentor's acceptance of you into the laboratory, to the Chair of the Program via the Program Coordinator. See additional information under "Mentor Selection".

Masters students must prepare, in conjunction with their faculty mentor, and submit to the BME Program Committee, a proposed Plan of Study by March of their first year.

The Program Committee will evaluate student progress, annually, using input from both the student and mentor. All students must submit an Annual Report each year.

YEAR 2

At the beginning of the second year, doctoral students should prepare, in conjunction with their faculty mentor, and submit, to the BME Program Committee, a proposed Plan of Study, no later than their third semester. You and your mentor should work on this together. This Plan of Study should be revised and re-submitted as changes occur throughout your graduate studies. You should have established your major and minor fields of study and have determined the necessary course sequences. You should also be in the process of formulating a doctoral dissertation research project, and conducting preliminary experiments.

M.S. students should complete all required coursework including 6 credits of BME 910 thesis or 3 units of BME 909 master's report (see Program Office for clarification). A thesis or report should be submitted and defended to obtain the M.S. degree.

Doctoral students should have formed, and be meeting with, their comprehensive exam committee, and complete their comprehensive exams in the second year, but no later than the fifth semester.

Doctoral students must also submit, with their annual Progress Report, a 1 to 3 page research proposal with their suggested research aims (which can be an expansion, if necessary, to what is submitted with their Plan of Study).

[The remainder of the TIME LINE applies to students working toward the Ph.D.]

YEAR 3

At the end of your third year, you should have completed the lecture courses required for a major in Biomedical Engineering.

Plan to take your Comprehensive Examination no later than the fifth semester. The Comprehensive Exam consists of written and oral portions (see above). It is suggested that you schedule several meetings to discuss the possible scope of questions with your committee. Note that to remain eligible for Program funding, you must complete the Comprehensive Examination by the end of the fifth semester. Coordinate the examination and schedule with the BME Program Office.

No later than your fifth semester in residence, finalize a Dissertation Committee. The earlier you meet with the committee members, the better. Inform your committee of your Plan of Study and your research project. Solicit input from the committee members during the writing of your Research Proposal. Note that students are required to have at least one meeting, per year, with the dissertation committee, during years 3-5. More frequent meetings are recommended. Written minutes of these meetings must be sent to all committee members, and a copy sent to the Program Coordinator.

At the end of year three, with their annual Progress Report, students must submit a formal research proposal, 3 to 5 pages in length, approved by their dissertation committee. A pre-doctoral proposal submitted to an outside agency would meet this requirement.

YEARS 3 – 5

Complete the presentation of the required full-length seminar. This seminar is one of two that you are required to give (the second may be a part of your final defense). It is your responsibility to contact the chairperson of the seminar series to be included in the list of scheduled speakers.

YEARS 4 & 5

Each year, update the previous year's research proposal, and submit with the Annual Report.

Final Semester

Present your dissertation research at one of the weekly BME seminars during the last Fall in residence.

Obtain the "Manual for Theses and Dissertations" the Degree Certification website at http://grad.admin.arizona.edu/degreecert/thesismanual/front.htm. This manual contains the directions for formatting your dissertation; however, you and your mentor should determine the overall organization of the dissertation. It is the responsibility of your Mentor to proof your dissertation.

The original form, the "Announcement of Oral Defense Examination" must be submitted to the BME Program Office at least two weeks before the date of your final exam. The Program Office will obtain the Program Chair's signature and submit the appropriate number of copies to the Graduate College.

Penultimate copies of your completed dissertation manuscript must be distributed to your committee members at least three weeks before your final exam.

After passing your final exam, a final copy of your dissertation must be submitted to the Program Office.

Questions regarding submitting forms, Graduate Representatives, and/or deadlines should be directed to the BME Program Office.

TEACHING

The Biomedical Engineering faculty believes that teaching experience is an integral part of the graduate training program. Accordingly, all students are encouraged to participate in teaching activities throughout their tenure in the Program. Students are not expected to present formal lectures in the first semester, but generally assist the faculty by tutoring or teaching small groups of students in laboratory settings

PROGRAM ADMINISTRATION

The Biomedical Engineering Program is administered by an Executive Committee that consists of 5 members who represent the major areas of Biomedical Engineering. These members include the Chair of the Program, the Chairs of the standing subcommittees, one at-large member and one student representative. Additional information on the administration of the Program is provided in the bylaws, which are included in Appendix I. The Program standing subcommittees, their responsibilities and members are:

1. Recruiting and Admissions Subcommittee -- The committee is responsible for publicizing the Program, recruiting, evaluating applicants, and recommending admission of qualified candidates to the Executive Committee.

2. Program Subcommittee -- The committee is responsible for curriculum and course development, evaluation of graduate student progress, maintenance of the Graduate Handbook (which states the policies and procedures for graduate education), and mediation of the concerns and grievances of graduate students. A graduate student is elected by their peers to serve on this Committee. Graduate students are encouraged to consult with any member of the Program Committee to resolve any issue related to their graduate education that is of concern.

3. Resources Subcommittee -- The committee develops and implements the financial plan for the Program, including offering graduate students assistance in obtaining extramural pre-doctoral awards.

4. Activities Subcommittee -- The committee has the charge of promoting interdisciplinary activities among the participants (graduate students, post docs, and faculty) of the Biomedical Engineering Program. This is accomplished by organizing poster sessions, welcoming and year-end annual picnics, fostering an interactive environment in Student Forum, and maintaining the dissemination of information among Program participants. The Activities Subcommittee also has responsibility for organizing the weekly BME Seminar Series (BME 696A). Membership includes two graduate students and one postdoc in addition to the faculty.

FINANCIAL STRUCTURE

The funds utilized by the Program to support graduate-student stipends are derived from Research Grants, Training Grants, Graduate College Fellowships, Teaching Assistantships, and faculty contributions. In general, these funds dictate the number of students supported by the Program. Since the NIH training grant stipends and some of the teaching assistantships are lower than the levels approved by the BME Program, these stipends may be supplemented by the faculty mentor of the Program.

Stipends

The Graduate College approves the level of graduate-student stipends and they are comprised of two components: living allowance and fees allowance. Students with training grant appointments have their tuition and fees paid directly by the grants. Students on research or teaching assistantships have out-of-state tuition waived and the student pays registration fees from their fee allowance.

For the semester of their expected graduation, and each successive semester afterward, students will receive support on a per-semester basis, pro-rated if necessary from the fiscal year rate. A student at any level whose stipend is pro-rated will still receive the full amount of their registration fees.

It is the intent of the Biomedical Engineering Graduate Program to provide financial support utilizing a combination of Program funds and mentor contributions with the stipulation that adequate progress is being made towards the degree.

Students are eligible to increase to the Graduate Associate stipend rate the beginning of the next spring or fall semester after they successfully pass the written and oral components of the Comprehensive Examination.

Graduate Registration Scholarships

The Registration Scholarship waives registration fees only (does not include the recreation center, Arizona financial aid trust fund or the ASA and KAMP fees). The Resources Committee administers the application and awarding of this scholarship.

Predoctoral Fellowships

The Program encourages individual students to seek supplementary funding. The advantages of seeking predoctoral fellowships are that it provides you with an opportunity to develop grant-writing skills, it brings prestige to the Program, enables the Program to recruit more students, and permits you to supplement (increase) your stipend. The Resources Committee can provide guidance in this endeavor by identifying potential funding agencies. The student is expected to write the proposal in consultation with the mentor and/or with the advice of the Resources Committee.

Conferences

The Program believes that participation in scientific meetings and conferences is an important experience for graduate students and encourages all students to submit work for presentation at national meetings. To aid in this activity, BME doctoral students can apply to the Program for travel support after their first year. The intent of the Program is that BME students are able to attend one national meeting per year. Students applying for travel funds are expected to have submitted an abstract/paper to the meeting/conference as the presenting author. Students are also expected to be in good standing with the Program and progressing towards their degree along the appropriate timeline. Travel Request Application Forms are available in the Appendix, in the BME Program Office, and also online, through the BME website. The program encourages all students to also apply for travel awards from sources outside the Program. One such possibility is the Graduate and Professional Student Travel Grant Fund - Contact the Graduate College at 621-9091 to receive copies of the application forms and attachments.

Outside Employment

The Program believes graduate studies and research is a full-time effort. Students considering outside employment (other than self-funded MS students) must first meet with the Program Chairman, and their mentor if applicable, to determine whether such employment is allowable by the stipulations of their funding source and to establish whether this employment would create a conflict of commitment that would seriously affect their progress.

Appendix I

BME 597G- Laboratory Rotation

Student _____ Date (Semester/Year)

Mentor

Before starting the rotation the student and mentor must agree upon a brief outline of the anticipated time course of the rotation, and the work to be performed. Upon completion of the rotation the student and mentor must submit a summary of the work and training accomplished.

Summary/Evaluation:

Signatures _____ Faculty Member

_____ Student

Appendix II

Partial Listing of Courses Available for Graduate Credit

(updated Fall 2008)

The following list represents course offerings students in the Biomedical Engineering Program have taken, and that may or may not currently be offered by the respective departments. Please consult the current University Schedule of Classes for class offerings and availability. Additional graduate level courses in these and other departments may also be taken for graduate credit at the discretion of the student and their mentor.

Department/ Course number	Title
Aerospace and Mechanical Engineering (AME)	
563	Finite Element Methods
566	Biomechanical Engineering
583	Micro Biomechanics
588	Micro & Nano transducer Physics & Design
662	Micromechanics
Agricultural and Biosystems Engineering (ABE)	
508	Environmental Simulation
515	Engineering of Biological Processes
516	Simulation of Biological Systems
519	Engineering Properties of Biol. Materials
523	Biosystems Analysis & Design
547	Sensors and Controls
581b	Cell & Tissue Engineering
584	Advanced Biosystems Transport Phenomena
586	Biomaterial Tissue Interactions
588	Micro & Nano Transducer Physics and Design
Animal Sciences (AN S)	
535	Biotechnology in Animal Science
585	Domestic Animal Endocrinology
Biochemistry (BIOC)	
564	Neurophysiology: Sensorimotor Perspective
565	Enzymes
567	Computational Biophysics
572	Cell Regulation
585	Biological Structure I
Cell Biology and Anatomy (CBA)	
565a	Fundamentals of Light Microscopy and Electronic Imaging
575	Special Topics in Biological Imaging
Cancer Biology (CBIO)	
555	Cancer Therapeutics

Department/ Course number	Title
Chemical & Environmental Engineering (CHEE)	
554	Law for Engineers and Scientists
570	Fundamentals of Polymeric Materials
573	Biodegradation of Hazardous Waste Compounds
577	Physiological Basis of Microbial Treatment Processes
580	Bioseparation Techniques for Engineers
581	Bioreactor Engineering
585	Biomedical Transportation Phenomena
586	Advanced Biomedical Engineering
Chemistry (CHEM)	
534b	Practical Nuclear Magnetic Resonance Spectroscopy Lecture
584	Nuclear Magnetic Resonance Spectroscopy
Computer Science (C SC)	
570	Foundations of Artificial Intelligence
Ecology and Evolutionary Biology (ECOL)	
568	Comparative Physiology
579	Art of Scientific Discovery
Electrical and Computer Engineering (ECE)	
525	Reverse Engineering
531	Image Processing Laboratory for Remote Sensing
532	Computer Vision
533	Digital Image Processing
541	Synthesis of Control Systems
548	Adaptive Control Systems
559	Fundamentals of Optics for Electrical Engineers
579	Principles of Artificial Intelligence
Materials Science and Engineering (MSE)	
503	Applied Surface Chemistry
504	Optical Spectroscopy of Materials
509	Transport Phenomena
510	Thermodynamic Characterization of Materials
512	Physical Chemistry of Materials
520	Optical Materials for Solid-State Laser Systems
523	Electrochemistry in Materials Science
532	Solid-Fluid Reactions
533	Imperfections in Solids
534	Advanced Topics in Electronic Materials
535	Corrosion and Degradation
540	Thermodynamics of Condensed Phases
551	Atomistic Computational Techniques in Materials Science
552	Nondestructive Evaluation of Materials
557	Integrated Circuit Laboratory
560	Materials Science of Polymers
561	Biological and Synthetic Materials
562	Structure and Properties of Polymers
565	Microelectronic Packaging Materials

Department/ Course number	Title
(MSE continued)	
570	Technology of Polymers and Ceramics
571	The Formation and Structure of Glass
572	Kinetic Processes in Materials Science
588	Scanning Electron Microscopy
Mathematics (MATH)	
509	Statistics for Research
Microbiology and Immunology (MBIM)	
695b	Immunopathology
Molecular and Cellular Biology (MCB)	
511	Topics of Molecular Biology
512	Biological Electron Microscopy
516	Bioinformatics and Genomic Analysis
577	Principles of Cell Biology
695e	Science, Society and Ethics
Neuroscience (NRSC)	
502	Principles of Neuroanatomy
582	Topics in Neural Development
584	Cellular Neurobiology
586	Intracellular Messengers
588	Prin. of Cellular & Molecular Neurobiology
589	Principles of Systems Neurobiology
Optical Sciences (OPTI)	
508	Probability and Statistics in Optics
538	Medical Optics
630	Biomedical Optics and Biophotonics
638	Advanced Medical Imaging
Pathology (PATH)	
515	Basic Human Pathology
Pharmaceutical Sciences (PHSC)	
507	Pharmacokinetics
508a	Pharmacokinetics Discussion
609a,b	Pharmacokinetics
Pharmacology & Toxicology (PCOL)	
550	Drug Disposition & Metabolism
551	Molecular Biology of Pharmacological Agents
554	Cardiovascular Pharmacology
620	Principles of Pharmacology
653	Neuropharmacology

Department/ Course number	Title
Physics (PHYS)	
502	Medical Physics
530	Introduction to Biophysics
Physiological Sciences (PS)	
503	Cellular and Molecular Physiology
595	Colloquium
601	Systems Physiology
602	Readings in Systems Physiology
610	Research Methods in Physiology
620	Intro to Systems Neurophysiology
625	Human Neuroscience
696	Seminar/Forum
697	Workshop (tutorials)
Speech & Hearing Sciences (SP H)	
549	Survival Skills for Students
Surgery (SURG)	
800	Intro to Surgical Research
815L	Orthopedic Biomechanics/Biomaterials
815F	Orthopedic Surgical Research
815H	Lymphvascular Sys. Health & Disability
Systems and Industrial Engineering (SIE)	
510	Behavioral Judgement and Decision Making
511	Human Factors & Ergonomic Design II
530	Engineering Statistics
551	Modeling Physiological Systems
585	Robotics and Automation
685	Advanced Topics in Robotics and Automation
Veterinary Science (V SC)	
543	Research Animal Methods

Appendix III

CODE OF RESEARCH ETHICS
Subscribed to and Adopted by the University of Arizona Faculty Senate
on December 7, 1998 for University of Arizona Faculty and Research Personnel

We the members of the University of Arizona (UofA) faculty and UofA researchers (hereafter: research community) are engaged in the quest for knowledge, in scholarly and artistic pursuits (hereafter: research) with the ultimate goal of benefiting humankind. Our quest is founded on the fundamental principles of honesty and trust.

The UofA research community pledges, by the adoption of this code, to engage in the responsible practice of research, required for keeping such trust, by adhering to and being accountable for the following principles and practices.

I. In fulfilling our obligation to the public as a whole, we expect that all individuals within the UofA research community shall:

- promote and follow research and professional practices that enhance the public interest and well-being;
- use public and private funds responsibly in the pursuit of research endeavors;
- adhere to government and institutional regulations for research such as those ensuring the welfare of human subjects, the welfare of fellow researchers, the comfort and humane treatment of animal subjects and the protection of the public and the environment; and
- report research findings resulting from public and private funding in a full, open, and timely fashion to the relevant research community;

II. In fulfilling our obligations to our colleagues, we expect that all individuals within the UofA research community shall

- have actually carried out experiments, projects and other scholarly activity in the manner reported;
- represent their best understanding of the work in their descriptions and analyses of it;
- accurately describe experimental methods utilized in sufficient detail to help insure their repeatability by others;
- share unique propagative materials developed through publicly-funded research with others in the field in a reasonable fashion;
- not report the work of others as if it were their own; strive to insure that due recognition is given where credit is due to collaborators including students and trainees;
- adequately summarize previous relevant work and ideas with proper attribution to those who pioneered the work;
- when acting as reviewers or editors, treat submitted manuscripts and grant applications confidentially and refrain from inappropriate use;
- and disclose financial and other interests that might present a conflict-of-interest, and make every effort to avoid such conflicts perceived or real.

III. In fulfilling obligations to students and trainees, we expect that all individuals within the UofA research community shall

- provide training and experience to advance the students’ and trainees' scholarly skills and their understanding of the importance of ethical practice and behavior;
- provide appropriate support in advancing the careers of students and trainees;
- recognize publicly and appropriately the scholarly contributions of the trainees;
- encourage and support the publication of results of trainees' research in a timely fashion without undisclosed limitations; and
- work together to create and maintain a working environment that is safe and that encourages individual integrity, plurality, open communications, and fairness without regard to gender, race or belief.

Appendix IV

Biomedical Engineering Course Requirement Worksheet

Name_____Date_____Previous Degree(s)_____

Ph.D.

Required (Hrs)	**Semester**
BME 510 (3)	
BME 511 (3)	
BME 517 (3)	
Choose at least two different focus areas (6 units) of: BME 516 (3) – Bio-imaging BME 561 (3) – Bio-materials BME 566 (3) – Bio-mechanics BME 586 (3) – Bio-materials	
BME 595B Ethics course (2)	
BME 696A Seminar/ 696C Forum Required each semester (6 units)	
BME 597 Rotation (3 units)	
Units in the Major (15) List:	
Units in the Minor (min. 9)+	
Thesis Units (min. 18) BME 920	
Total = 68 minimum	**Total = _____**

*****Students entering the program with a M.S. degree may petition to apply previous graduate coursework to the Ph.D. degree requirements. The Graduate College requires that at least 30 units of graduate credit must be completed at The University of Arizona. +Students choosing a BME Distributed minor need 12 units in the minor

Appendix IV

Biomedical Engineering Course Requirement Worksheet

Name_____Date_____Previous Degree(s)_____

Master of Science

Required (Hrs)	**Semester**
BME 510 (3)	
BME 511 (3)	
BME 517 (3)	
Choose at least two different focus areas (6 units) of: BME 516 (3) – Bio-imaging BME 561 (3) – Bio-materials BME 566 (3) – Bio-mechanics BME 586 (3) – Bio-materials	
BME 595B Ethics course (2)	
BME 696A Seminar/ 696C Forum Required each semester (4 units)	
BME 597 Rotation (2 units)	
Advanced coursework (9) - List	
BME 910 Thesis (6) **or** BME 909 Masters Report (3) and additional coursework (3)	

Total = 38 minimum	**Total = _____**

Appendix IV

BIOMEDICAL ENGINEERING GRADUATE STUDENT ANNUAL REPORT

2007-08 Semester/Year of First Enrollment: _____

Name:_____ Mentor:_____

Co-Mentor:_____

Total Graduate Units Completed to Date: Total Units:_____ Letter Graded Units:_____

Laboratory Rotations/Experiences: (For first year students, list your lab rotations and include a description of efforts made to identify a Mentor and a laboratory in which to do your dissertation research. For students who have identified a lab, describe overall laboratory experiences. Use back of page if necessary).

Meetings with Committee: (All students are required to meet at least annually with their research/dissertation committee, beginning within the year after approval of their plan of study. Comp exams do not fulfill this requirement. List all dates since formation of committee.

Other BME Program Activities: (committee participation, participation in recruiting, poster, or seminar presentations, social activities, etc.) List title/description and date(s)

Membership in Professional Societies and/or Community Service

Teaching Activities:

Professional Meetings: (Name of Meeting, Location. Did you give a presentation? If so, give title)

Publications: (Refereed articles, abstracts. Full bibliographic citation.)

Honors & Awards Received:

_____ _____

Student signature Date

_____ _____

Mentor/Advisor signature Date

Mentorship Evaluation Form – Biomedical Engineering Program Student Annual Report Page 2

To be completed by trainee for primary mentor; additional forms for secondary mentor(s) can be provided if desired. All evaluations will remain confidential to the Program Committee.

This evaluation is for (circle one): Primary Mentor Secondary Mentor

Name of mentor_____

Circle one: 1= Disagree strongly 2= Disagree 3= Agree 4= Agree strongly

Topics	Rating	Comments (Additional comments may be written on back of this form)
Intellectual Growth and Development: Helps me become increasingly independent in identifying research questions and conducting and publishing my research	1 2 3 4	
Helps me develop my capacity for theoretical reasoning and data interpretation	1 2 3 4	
Provides thoughtful advice on my research progress and results	1 2 3 4	
Professional Career Development: Provides opportunities for me to meet with visiting scientists, faculty and peers	1 2 3 4	
Maintains balance between supporting his/her own research and developing my own career	1 2 3 4	
Provides training in the skills needed to mentor others	1 2 3 4	
Academic Guidance: Provides advice on my coursework and academic goals	1 2 3 4	
Ensures that I am firmly grounded in rules regarding good laboratory practice, ethical behavior and scientific responsibility	1 2 3 4	
Skill Development: Helps me to work effectively with other individuals	1 2 3 4	
Provides constructive feedback on my presentation and writing skills	1 2 3 4	
Personal Communication: Listens carefully to my concerns	1 2 3 4	
Takes into account gender, ethnic and cultural issues in interacting with me	1 2 3 4	
Is appropriately accessible to me	1 2 3 4	
Serves as Role Model: Conveys high ethical standards and concern for research subjects	1 2 3 4	
Illustrates active teamwork and collaboration	1 2 3 4	
Illustrates good work habits	1 2 3 4	
Illustrates good mentoring skills	1 2 3 4	

Appendix V

Sample Format for Mentor Acceptance Letter
(Substitute actual information for examples *in italics;*
both the faculty advisor and the student sign)

Today's Date

Allen B. Peterson, Ph.D., Chair
Biomedical Engineering Graduate Interdisciplinary Program
University of Arizona
1657 E Helen Street
Tucson AZ 85721

Dear Dr. *Peterson*:

This is to confirm that I will officially serve as *Jeremiah Bullfrog's* advisor and mentor during *his* doctoral studies in Biomedical Engineering at the University of Arizona. I look forward to a productive and engaging collaboration with *Jeremiah*. *Mr. Bullfrog* and I have worked together on an initial project involving *mechanical tissue printing*, and are now developing *a machine that will fabricate entire artificial organs utilizing cornstarch and flies as the raw material.* I will endeavor to ensure that *Jeremiah* has financial support during *his* tenure as a graduate student, and that *he* completes the requirements for the doctoral degree in a timely fashion.

Thank for you for the opportunity to participate in the Biomedical Engineering GIDP here at the University of Arizona, and work with such an outstanding student.

Sincerely,

Albert "Big Al" Einstein, Ph.D.
Professor
Math/Physics/Biomedical Engineering

Jeremiah Bullfrog, B.S.
Graduate Student
Biomedical Engineering

Appendix VI

Biomedical Engineering
Travel Assistance Request

_____	_____
Name	Date
_____	_____
Name of Conference	Dates of Conference
_____	_____
Location of Conference	Estimated Cost of Request

To request assistance, you must be the primary author on an abstract, and a Ph.D. student in good standing (see BME Handbook for definition of "good standing"). The signature, below, indicates that you are in compliance with these terms. Your mentor's signature indicates that they are in agreement with these terms.

_____	_____
Student Signature	Mentor Signature

Please attach a copy of your mentor-approved abstract

When completed, submit this form, with documentation of accepted abstract, to Debbi Howard. The Resource Committee will review the request and notify you of the decision.

Appendix VII

Biomedical Engineering: Absence Request Form

All students must complete and submit to Program Coordinator, if absent for more than 2 days.

Date: _____

Name:_____

( ) Vacation
( ) Comp time
( ) Sick (may be completed upon return, if unplanned)
  ( ) Personal illness
  ( ) Family illness
( ) Jury duty
( ) Other_____

First day away from work:_____

Date of return to work:_____

During my absence, I can be reached as follows:

_____

_____

_____
Employee signature

_____
Mentor/Supervisor signature

Appendix VIII

Guidelines for Mentors

Biomedical Engineering Graduate Interdisciplinary Program

Version Draft II July 12, 2006

Introduction: The purpose of these guidelines is to inform mentors of important aspects of the Biomedical Engineering Graduate Interdisciplinary Program (BME GIDP). This handbook is not an all-inclusive document; official BME GIDP policy can be found in the BME Graduate Handbook, available on the BME web site (www.bme.arizona.edu).

> BME mentors advise, challenge, and guide their students. They assure that the student is making appropriate progress to degree and identify sources of support for the student. The following describes the specific and sometimes unique role of a BME mentor.

Mentor eligibility: Any tenure-eligible faculty who is a member of the BME GIDP may mentor a BME student. To apply for membership in the BME GIDP, contact the BME graduate coordinator at 626-9134. Non tenure-eligible faculty may serve as a day-to-day mentor for students, but the faculty and student must identify an eligible faculty to serve in the official capacity of mentor. The official mentor is expected also to abide by these BME mentor guidelines.

Rotations: BME students perform laboratory rotations during their first two semesters, and select a mentor by the end of the second semester. The primary purpose of rotations is to facilitate the process of students finding a mentor, and potential mentors identifying students. In some cases, students who already have a mentor may wish to perform rotations in order to obtain training not available in their own laboratory. The purpose of the rotation should be made clear by the student. A rotation should last for approximately 45-60 hours. Longer time periods can be agreed upon by the student and faculty, for additional rotation units. The student should write up a short description of the rotation activities and objectives, to be agreed upon by the faculty. A one-page report is required from the student at the end of the rotation, to be signed by the mentor, and submitted to the Program Coordinator.

> The rotation is an opportunity for the potential mentor and the student to determine if they are compatible from a research qualifications/interest and a personality standpoint. BME students are expected to ask, and potential mentors are urged to honestly answer, questions about future research projects, student/project funding availability, and laboratory expectations.

Selection of mentor: Upon agreement to serve as a mentor, a letter needs to be sent to the BME GIDP Chairperson (sample letters are available in the appendix of the BME Student Handbook), The letter should state that the mentor has agreed to serve as the student's advisor, will endeavor to ensure that the student has financial support during his/her tenure as a graduate student, and will assure that the student completes the requirements for the degree in a timely fashion. The letter must be signed by both the student and mentor.

Student timeline: The mentor should assure that the student adheres to the timeline set out in the BME Graduate Handbook. A copy of this timeline is attached. A summary of important deadlines (for Ph.D. students) is as follows:

Submission of annual report: every year by April 15
Submission of plan of study: end of third semester
Formation of comprehensive committee: end of third semester
Completion of comprehensive exams: end of fourth semester; no later than fifth
Formation of dissertation committee: end of fifth semester

Dissertation committee meetings: end of sixth semester, subsequently at least annually
Final Defense: expected to be by the end of the fifth year

Failure of the student to progress will make the student ineligible for BME travel funds, promotions, or raises. Assistance by the mentor in assuring that students follow this timeline is critical for student success. Additional information on each of these milestones is provided below.

Annual report: The student submits a report each year describing progress in coursework, research, BME activities, publications, and related activities. In later years, a description of the research plan is attached. The student should prepare the annual report, and the mentor and student jointly review it. The annual report is reviewed by the BME program subcommittee to evaluate student progress and compliance with the milestones. However, it is also intended to be an opportunity for the student and mentor to reflect on the year's achievements and develop plans for the subsequent year.

Plan of study: The plan of study should be submitted to the BME program office by the end of the third semester. The plan of study identifies the body of coursework to be taken, to fulfill the requirements of the BME GIDP, and should be jointly agreed upon by the student and mentor. A worksheet is available in the appendix of the BME Student Handbook to assist in assuring all BME requirements are met. In addition to the course listing, students must submit a one-paragraph summary of the proposed dissertation research area and a listing of the proposed comprehensive examination committee members.

The mentor, BME program subcommittee, and the BME GIDP Chairperson must all approve the plan of study, prior to submission to the Graduate College. A plan is unlikely to be approved if it contains less than two courses, each, that provide significant depth of knowledge in an area of life sciences and engineering (in addition to the core courses). However, the main criteria for acceptance is adequate preparation for the student's research activities. It is expected that the plan of study may change during the student's tenure; modified plans are approved by the same process as the original.

Comprehensive examinations: The details of the comprehensive examination process are provided in the BME handbook. The student is encouraged to take both the written and oral portions of the exam as early as practical, but not later than the fifth semester. Students should meet with their committee members individually, and as a group, to discuss the possible scope of questions with them, well in advance of the examination.

Dissertation committee: The student must meet with the dissertation committee by the end of the sixth semester, and subsequently no less than once per year. The purpose of the committee meetings are to define an acceptable scope of work for the dissertation, obtain feedback on research results, and gather suggestions for future research efforts.

Defense: The BME Ph.D. is designed to be a 5 year program. Significant extension beyond this time should be discussed with the dissertation committee and a plan for completion developed.

Student difficulties: The mentor is requested to notify the BME program office if he/she notices that the student is experiencing difficulties that are impacting research or academic progress. The BME Program Coordinator, BME GIDP Chair, and the BME Program Committee are available to assist in resolving student or student/mentor conflicts.

Questions? Please contact:
BME Program Coordinator, Debbi Howard, dhoward@email.arizona.edu 626-9134
BME GIDP Chair, Jennifer Barton, barton@email.arizona.edu 621-4116