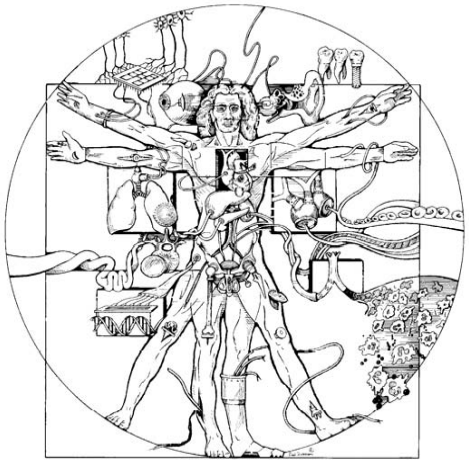
Biomedical Engineering Program

University of Arizona

Graduate Handbook

July 2006



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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 faculty, and the Graduate College. This handbook should be read upon entering the Program, and used henceforth in connection 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) experience and training in teaching, and 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)
- 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 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 each in computing and in life science are normally required for admission. Applicants lacking some of these requirements at the time of application may provide a plan for completion of these requirements prior to admission, or may request conditional admission status. All applicants must submit scores from the Graduate Record Examination (GRE) general test.

Graduate College Degree Requirements

The student is 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. Beyond that point, full-time required enrollment will be 9 graduate units per semester, although students are urged to complete their graded coursework as early as possible.

Graduate College regulations will determine the minimum hours of graded coursework required. Currently for masters students, one half of the required units must be graded coursework; doctoral students must have at least 23 graded units. This refers to courses in which regular grades (A, B, C) can be earned, and that are numbered at the 500 level or above. For doctoral students, six units of 400-level credit taken at The University of Arizona while a graduate student may be used in the minor, if approved by the minor department and the BME Program Committee, but will not receive graduate credit or be calculated in the graduate grade-point average.

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.

Biomedical Engineering Courses

510. Biology for Biomedical Engineering (3) Basic biological principles governing cellular processes and links to applications in medicine, engineering and applied sciences.

511. Physiology for Biomedical Engineering (3) Fundamental concepts and principles in Physiology relevant to the field of biomedical engineering and including a survey of material necessary for an understanding of physiological principles.

516. **Principles of Biomedical Engineering** (3) Designed for BME students, engineering principles governing the behavior of biomedical systems including solid and fluid mechanics, mass and heat transport, system dynamics and related mathematical techniques with applications in biomedical engineering.

517. **Measurement and Data Analysis in Biomedical Engineering** (3) Topics in biomedical instrumentation, sensors, physiological measurements, analog and digital signal processing, data acquisition, data reduction, statistical treatment of data, and safety issues. Course includes both lecture and structured laboratory components.

595B. Scientific Writing Strategies, Skills and Ethics (2) Provide students with skills to write/communicate effectively for a variety of scientific audiences; including scientific journals, funding institutions, potential employers as well as administration in academia and industry.

597G Research Methods in Biomedical Engineering (1-3) [Rpt./6 units]. A requirement of all students in the BME Graduate Program. Students must complete laboratory rotations of 45 contact hours per unit of rotation in any participating faculty lab. Students choose and schedule their rotations after becoming familiar with the faculty research interests. The rotations expose the student to a number of research areas in Biomedical Engineering and assist in the student's choice of a dissertation/thesis advisor. Prior to performing a rotation, the student should meet with the prospective mentor to discuss the nature of the rotation. A brief report of what was accomplished in each rotation must be submitted to the Program with the rotation faculty's signature at the end of each rotation. Ph.D. candidates in Biomedical Engineering must complete at least 3 rotations (3 units). Limited to BME major & minor graduate students.

693. Clinical/Industrial Internship (3) Specialized work consisting of individual training and practice in actual service in a clinic or in a technical, business, or governmental establishment.

696A. Biomedical Engineering Seminar (1) Weekly Biomedical Engineering Seminar series

696C. Biomedical Engineering Student Forum (1) This course is an opportunity for students to exchange ideas, present research topics, and invite guest speakers

MCB 695e. Science, Society, and Ethics (1) Molecular and Cellular Biology, Science, Society, and Ethics. Explores ethical issues that specifically arise in the research laboratory setting, such as fraud, fabrication and plagarism. It also addresses mentoring, conflict of interest, authorship and peer review (grants and manuscripts), ownership of data and intellectual property, and the scientist in society.

Master Of Science (MS) Program

All master's students in the program must take 36 units of graduate credit including the following 32 units of courses:(a) four Biomedical Engineering core courses, BME 510, 511, 516, and 517; (b) ethics, a BME approved ethics course; (c) seminar, BME 696A (2 units); (d) 2 units of methods/laboratory rotation, BME 597G; (e) 9 units in graduate engineering, life or physical sciences, or mathematics courses; and (f) 6 units of 910 thesis OR 3 units of BME 909 Master's Report and 3 additional units in graduate engineering, life or physical sciences, or mathematics courses. The remaining 4 units may be chosen by the student to supplement their plan of study. All students are encouraged to attend the weekly BME seminar series. A final thesis or report defense is required.

The 15 units of (e) and (f) 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 advisory committee. The courses chosen should be based on the student's area of specialization (see Appendix III 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 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 committee members, no later than the end of the second semester or completion of 18 credit hours in the program. If the student and mentor alter the original goals, an amended plan shall be submitted to the Program Committee for approval.

Students, upon approval by the advisor and student's graduate committee, have the option of writing either a masters thesis or masters report. The format for the thesis shall follow the instructions specified by the Graduate College. Students shall complete 6 units of BME 910 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 two bound copies of the thesis to the BME program. Instructions on the form for the bound copies can be obtained from the BME Program administrator. Submission of copies for microfilming and permanent archive through University Microfilms, Inc. is optional but strongly suggested. Instruction for UMI submission and corresponding deadlines can be found on the Graduate College web page.

The contents and format of the masters report will be determined by the student and advisor, and approved by the student's graduate committee. The masters report is not necessarily based on original laboratory research but is an original contribution of the student. Examples of masters reports might include a commented literature review, a student-authored grant proposal, a submission-ready manuscript plus supplementary material, or a report on original research that is not of the depth or format to qualify as a masters thesis. The student shall complete 3 units of BME 909 Master's Report and 3 additional units of engineering, life or physical science, or mathematics courses. The student is required to defend their report

to the graduate committee, and submit two copies of the final report to the BME program.

In some cases, certain MS degree requirements may be waived if equivalent course work has been completed previously. However, if a waiver is desired, the student must submit a written petition to the Program Committee, which will either grant or deny the waiver. Individual faculty are not authorized to waive any of the Program requirements without prior approval of the Program Committee. Transfer credit from other institutions can be applied towards an advanced degree if approved by the Program Committee, the grade earned is a B or above, and it was awarded graduate credit at the institution where the work was completed. Current Graduate College regulations will determine the maximum transfer credits allowed for the MS degree.

Minor In Biomedical Engineering

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. The doctoral minor is 12 units: 9 units of approved BME courses from BME 510, 511, 516 or 517, and 3 units of either Laboratory Rotation (BME 597G) or Independent Study (BME 599). Completion of these courses with a "B" average for the required units is required 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 two faculty members in the BME Program. The BME Program should receive a copy of the student's Doctoral Plan of Study at the time they declare their minor in BME.

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). Six units of 400-level course work in the minor study area are now allowed by the Graduate College; according to BME policy, these courses must be taken while the student is enrolled in a graduate program and the request to include in a plan of study must be approved by the BME Program Subcommittee (see Appendix IV).

Ph.D. Program

Doctoral students must complete a minimum of 67 units of graduate credit, and meet the Graduate College's minimum units of courses in which regular grades (A, B, C) have been earned. Requirements include 12 units of the core courses (BME 510, 511, 516 & 517); 18 units in the major; a minimum of 9 units in the minor; a minimum of 6 units and a maximum of 8 units of seminar courses, of which at least 4 must be BME 696A; 1 unit 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 such that the courses complement and broaden the student's previous degree(s) and provide the student with the skills necessary to complete the research. 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.

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

After completion of the required credits, a student may wish to obtain the MS degree. Refer to the preceding section of this handbook for the M.S. Program.

Ph.D. Program Requirements for Students with a Master of Science

Graduate students accepted into the program who have an MS degree may petition the Biomedical Engineering Program Subcommittee and the University of Arizona Graduate College to apply relevant previous graduate coursework to the Ph.D. degree requirements. However, the Graduate College residence requirement stipulates that the student must spend at least two regular semesters of full-time work in residence, and at least 30 units of graduate credit must be completed at The University of Arizona.

Qualifying Exam (revised November 11, 1999)

Qualification for the Ph.D. program requires that the student pass BME 510, 511, 516, and 517 (or transfer equivalent units) 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 entering 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 program committee may require a student to submit additional written work or take other courses before a decision can be made. The program committee will re-evaluate the student no later than the end of their 4th semester in the BME Program. After evaluating the additional work, then a final decision of pass/fail 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 Subcommittee, and the Chair of the Biomedical Engineering Program must approve the Plan of Study in turn prior to submission to the Graduate College.

Certain Ph.D. degree requirements may be waived if equivalent course work has been completed previously. The student must submit a written petition for a waiver to the Program Committee, which will either grant or deny the waiver. Individual faculty are not authorized to waive any of the Program requirements without prior approval of the Program Committee. Transfer credit from other institutions can be applied towards an advanced degree if approved by the Program Committee, the grade earned is a "B" or above, and it was awarded graduate credit at the institution where the work was completed.

Selection of Mentor

Each student should select a mentor no later than the end of the second semester (or completion of 18 credit hours) in the program. A mentor is a faculty member who will serve as an advisor, supporter, tutor, sponsor

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 masters students, the student is expected to work with the mentor and the Program to identify the source of the student's financial support after the initial year. 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 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 three 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) 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.

Once you have identified a mentor, you and your mentor must inform the Program Chairperson 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.

Selection of Comprehensive (and Dissertation) Committees

The composition of the Comprehensive Exam Committee and the Dissertation Research Committee is often the same. However, in certain cases, the compositions may be different. For example, a student's dissertation project may deal with a topic that is significantly different than the minor field of study. In this unusual case, it is recommended that faculty representing the minor serve on the Comprehensive Committee but not on the Dissertation Committee.

The student, in consultation with the mentor, should select the Comprehensive Examination Committee. The

Comprehensive Examination committee is composed of five faculty members, three with expertise in the major area of study, and two representing the minor area. At least two members of the committee must be faculty members of the Biomedical Engineering Program, and one from the faculty of the minor department or program.

Outstanding scholars from within or outside the University whose participation on the Comprehensive (and Dissertation) committee(s) will strengthen the academic quality of the student's program, and who are not faculty in Biomedical Engineering, may be appointed, by exception, with the approval of the Graduate College. The Program can make a request for "appointment by exception." This person is then a voting member of the student's committee. For tenure-track faculty in other programs, a memorandum is submitted to the Graduate Council explaining the academic rationale for including the faculty member on the student's committee. This memorandum is generally drafted in consultation between the student and mentor and co-signed by the Program Chair. For non-tenure track faculty, or for faculty from other universities, such a memorandum and an updated curriculum vita are required. The External Reviewer (to be cooperatively chosen by the student and mentor) should also be named at the time of the selection of the dissertation committee. This will encourage active participation of the external advisor during the student's course of training.

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).

Graduate College Representative

The Graduate Degree Certification Office will provide a Graduate College Representative who will monitor your Comprehensive Oral Examination. It is the responsibility of the student to insure that the "Application for Comprehensive Oral Examination" is in the Graduate Degree Certification Office at least three weeks prior to the exam date.

The Comprehensive Examination (revised February 9, 2000; amended October 13, 2004)

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

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 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 course work has been completed, and no later than three months prior to the date of the Final Oral Defense Examination. The Biomedical Engineering Program requires that both parts of the Comprehensive Examination must be completed by the end of the sixth 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 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 five faculty members, 3 from the your major and 2 from your minor. At least 2 members of the major committee must hold a tenured/tenure eligible appointment and be members of the BME Committee. At least 1 member of the minor committee must hold a tenured/tenure eligible appointment in the minor department. The 3rd member of the major committee and the 2nd member of the minor committee may be tenured/tenure eligible faculty members from another University of Arizona department. One member of the major or minor committee may be non-tenured or non-tenure-eligible if approved by the Graduate College prior to submission of the Request to Schedule the Oral Comprehensive Examination. Your mentor should be one member of the examination committee, and all five members will vote. b) Submit the names of the five proposed Comprehensive Examination Committee members to the Program Subcommittee for approval. c) Schedule your examination with the members of your committee ; d) Provide your committee with your study program, 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. Students are encouraged to meet with this 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 Chair of the Program Subcommittee, 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, including core course work. Six questions will be posed by the examiners. A copy of each question and an outline of the solution will be submitted to the Program Subcommittee Chair for review one week prior to the exam. The student will be required to answer 4 of the 6 questions including 1 question directed toward the students' knowledge of engineering, and 1 toward the life sciences. The remaining 2 questions will emphasize either engineering or life science. The examiners will identify the emphasis of each question so that in the first session at least 2 of the posed questions emphasize engineering and at least 2 questions in the second session emphasize life science. The students will answer their choice of 2 of the 3 questions posed in each session of the exam. The two unanswered questions will be the first questions presented during the Oral Examination

Each of the student's examination answers will be evaluated by the committee member who wrote the question. The student's answers, with written comments, should be returned to the student within 72 hours 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 Graduate Coordinator in the student's file. The examination committee shall determine whether the student has passed the examination. 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.

If the student's minor area of study is in a department outside of Biomedical Engineering, the Graduate College gives the Minor Department the option of waiving participation in the written portion of the comprehensive examination. However, the Minor Department must participate in the oral portion of the comprehensive examination.

After the written portion of the Comprehensive Examination has been completed successfully (review and acceptance by the Comprehensive Exam Committee), the student should file an "Application for Oral Comprehensive Examination for Doctoral Candidacy" form with the Graduate College. This form represents your first formal contact with the Graduate College Degree Certification Office, and the form and instructions for its completion can be found in a document entitled, "A Handbook for Completing the Steps to Your Degree: Doctoral Candidates". This document can be obtained from < http://grad.admin.arizona.edu/degreecert/handbooks/doctoral/index.htm> the BME Program Office, or from the Degree Certification Office. This form (the original plus three copies) must be submitted at least three weeks prior to the date of the Oral Comprehensive Examination. Students must be registered during the semester the written and oral examinations are taken.

Content of the Oral Comprehensive Examination

The following Graduate College regulations apply to the oral exam:
"...an oral portion which is to be conducted before a committee of five faculty members appointed by the Dean of the Graduate College, upon the recommendation of the major and minor departments. No student will be permitted a second attempt to pass the Oral Comprehensive Examination unless it is recommended

by the examining committee, endorsed by the major department, and approved by the Dean of the Graduate College."

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 and the area of minor specialization. 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 at least two hours and not more than 3 hours.

Advancement to Candidacy

After successful completion of the Comprehensive Exam, you are eligible for advancement to candidacy, and must complete the "Advancement to Candidacy○ form. This form must be completed in full and signed by your mentor and the BME Program Chair. An original plus 4 copies are required. Also, one copy is to be submitted to the BME Program Office. This form is submitted no later than six months before the Final Oral Defense Exam is scheduled. The exact dates in any given year can be obtained from the BME Program Office, the Graduate Degree Certification Office, and the Graduate College homepage.

Final Oral (Dissertation Defense) Examination

The final examination is your dissertation defense. The Announcement of Final Oral Examination form (original plus three copies) is submitted at least three weeks prior to the date of your examination. The form must be signed by all the dissertation/research committee members and the signatures must be obtained by the student and/or mentor. Doctoral students are encouraged to attend the weekly BME seminar and present their dissertation research at this seminar during the last year in residence. This presentation may be in conjunction with the formal dissertation defense.

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 booklet entitled "Manual for Theses and Dissertations," which is available at the ASUA bookstore and in the BME Program Office.

Final Copies of Dissertation Document

You must submit two copies of your dissertation to the Graduate Degree Certification Office. The copies must be signed by you and your committee, and presented unbound in a box with the microfilm form "Special Abstract" and an extra title page for microfilm processing (the Graduate College will mail to you the microfilm forms). Also, if you wish University Microfilms to copyright your manuscript a fee will be assessed. Finally, you must submit a letter from the Human/Animal Subjects Committee if your dissertation project was subject to such a review.

The dissertation is submitted by about April 20 for May graduation, November 26 for December graduation and August 5 for August graduation (contact the Graduate College for the exact deadline dates in a given year). The last requirement is to clear all fees with the Bursar's office, and this is done in the last week of the final semester.

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, 516 and 517, and a BME approved ethics course 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 department 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. 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 the end of their first year or completion of 18 credit hours.

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. 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. 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 should 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.

Submit the Advancement to Candidacy Form to the graduate college six months prior to intended graduation date.

Final Semester

Present your dissertation research at one of the weekly BME seminar during the last semester 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 plus three copies of the "Announcement of Oral Defense Examination" must be submitted to the Degree Certification office at least three weeks before the date of your final exam.

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

After passing your final exam, submit two final copies of your dissertation manuscript to Degree

Certification at least three weeks before your graduation date.

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. Guidelines for graduate teaching assistants are provided in Appendix VI.

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.

The amount that a student stipend will be adjusted depends on the amount of supplementary funding that is obtained. If a student receives an award of $499 or below, the stipend will be increased by the amount of the award. If a student receives an award between $500 and $4,999, the student's stipend will be increased by $500. If the student receives an award between $5,000 and the regular total cost of stipend and fees, the student's stipend will be increased by $1,500. Supplementary funding over and above the regular stipend and fees by more than $1,500 is not eligible for an additional increase from the Program or your mentor. An award of that size is considered supplemental compensation on its own.

If a predoctoral fellowship is awarded on the basis of an application made by the Program on your behalf, any increase in stipend will be at the discretion of the Resources Committee. Typically assignments to

various NIH or NSF training grants such as Cardiovascular Biomedical Engineering, IGERT, etc. are included in this category and do not qualify for stipend increase.

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 Appendix XI, 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.

Expenses

Depending on the availability of funds, an annual allocation will be made to each student for expenses related to photocopying, supplies, and dissertation preparation.

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

Biomedical Engineering Program By-Laws

The Interdisciplinary Biomedical Engineering Program is composed of research and graduate educational activities in a broad range of biological and medical engineering areas. The program involves faculty members from the Colleges of Medicine, Agriculture, Arts and Sciences, and Engineering and Mines who form the "Committee on Biomedical Engineering." The Executive Committee is appointed by and responsible to the Director of Graduate Interdisciplinary Programs, who reports to the Vice President for Research, Graduates Studies and Economic Development. The Executive Committee serves as the executive, policy and administrative agency for the Program. The structure and organization of the Committee on Biomedical Engineering shall conform to the Guidelines for Interdisciplinary Programs established by the Director of Graduate Interdisciplinary Programs.

It is the responsibility of the Biomedical Engineering Program to provide a graduate educational program in the various areas of biological and medical engineering, to publicize the program, and to maintain graduate and postdoctoral participants of the highest quality. It is also the responsibility of the program to maintain vigorous, productive research activities, to maintain an interacting community of biological and medical engineering scientists by providing seminars and promoting campus-wide interdisciplinary activities, and to identify promising areas of biological and medical engineering research and the faculty expertise and facilities needed to explore these areas.

Creative planning and leadership are essential to maintain and foster excellence in Medical and Biological Engineering research. These and related functions are served by the Committee on Biomedical Engineering and its Executive Committee. In the following sections the By-laws that govern policies and operating procedures are outlined.

Article I. Executive Committee and Chairperson of the Committee on Biomedical Engineering

The Executive Committee administers activities of the Biomedical Engineering Program. The chair of the Executive Committee shall also serve as Chairperson of the Committee on Biomedical Engineering. The Executive Committee will report to the Director of Graduate Interdisciplinary Programs and to the Deans of the Colleges of Medicine and Agriculture and of the Faculty of Science.

A. Chairperson of the Committee on Biomedical Engineering

1. The Chairperson of the Committee will be appointed by the Director of Graduate Interdisciplinary Programs from nominees submitted by the Executive Committee. The Chairperson will serve a renewable five year term.

    a. The duties of the Chairperson of the Committee are: a) call and preside at meetings of the Executive Committee as needed but not less than once per quarter; b) call and preside at meetings of the Committee on Biomedical Engineering at least once per year and as needed; c) appoint and supervise the Standing Subcommittees on Recruiting and Admissions, Program, Resources and Activities as detailed in Article II; d) administer the budget of the Committee on Biomedical Engineering; e) manage administrative matters (such as qualifying and thesis committees) with the Graduate College and Deans of the Colleges of Engineering, Agriculture and Medicine and of the Faculty of Science at meetings to be held no less than twice a year; and f) direct course change and approval forms and monitor catalogue copy.

2. The Executive Committee will consist of five faculty members representing the major areas of Biomedical Engineering and one graduate student. Faculty members of the Executive Committee will be appointed only from the members of the Committee on Biomedical Engineering. Each Executive Committee member will serve a three-year term, and the terms will be staggered so that at least two members of the Executive Committee are replaced each year. New members of the Executive Committee will be appointed each year by the Director of Graduate Interdisciplinary Programs from nominations submitted by the Executive Committee. The graduate student member will be elected annually by the students in good academic standing in the Program. Outgoing members of the Executive Committee are not eligible for reappointment to the Executive Committee until one year after the termination of the previous appointment.

    a. The Executive Committee is responsible for administering the graduate program in Biomedical Engineering including admission of graduate students and evaluation of continuing graduate students, publicizing the Biomedical Engineering program intra- and extra-murally, planning the development of the Biomedical Engineering Program, formulating the annual budget of the Committee on Biomedical Engineering, securing and allocating necessary funding, and advising the Director of Graduate Interdisciplinary Programs and the Vice-President for Research, Graduate Studies & Economic Development on issues pertinent to Biomedical Engineering.

Article II. Standing Subcommittees

A. The Subcommittee on Recruiting and Admissions shall be appointed annually by the Executive Committee on Biomedical Engineering and shall consist of at least three faculty members and one graduate student who represent the various disciplines within the Committee. At least one member of the Recruiting and Admissions Subcommittee shall be from the Executive Committee. The graduate student member will be elected annually by the students in good academic standing in the Program. The Recruiting and Admissions Subcommittee shall be responsible for publicizing the program, developing an active minority recruitment plan, evaluating applicants, and recommending admission of qualified candidates to the Executive Committee. At its discretion, the Recruiting and Admissions Subcommittee may ask a postdoctoral trainee to assist in its work.

B. The Program Subcommittee shall be appointed annually by the Executive Committee on Biomedical Engineering and shall consist of at least three faculty members and one graduate student who represent the various disciplines within the group. The graduate student member will be elected annually by the students in good academic standing in the Program. At least one member of the Program Subcommittee shall be from the Executive Committee. The Program Subcommittee shall make recommendations to the Executive Committee on curriculum and course development. The Program Subcommittee shall prepare and maintain the Student Handbook, suggest potential advisors to students, and, on a yearly basis, prepare an evaluation of graduate student progress. The Program Subcommittee shall submit the report of student progress by June 1 of each year to the Executive Committee.

C. The Resources Subcommittee shall be appointed annually by the Executive Committee on Biomedical Engineering and shall consist of at least three faculty members and one graduate student who represent the various disciplines within the group. The graduate student member will be elected annually by the students in good academic standing in the Program. At least one member of the

Resources Subcommittee shall be from the Executive Committee. The Resources Subcommittee shall be responsible for developing and implementing the overall financial plan for Biomedical Engineering including extramural fund raising for Program activities, identifying funding opportunities and advising students on predoctoral awards and applying for fellowships and scholarships from the Graduate College.

D. The Activities Subcommittee shall be appointed annually by the Executive Committee on Biomedical Engineering and shall consist of at least three faculty members, one graduate student, and one postdoctoral fellow who represent the various disciplines within the group. The graduate student member will be elected annually by the students in good academic standing in the Program. At least one member of the Activities Subcommittee shall be from the Executive Committee. The Activities Subcommittee shall be responsible for organizing educational and social events that promote interactions among the members of the Biomedical Engineering Program. These activities shall include at least one picnic at the beginning of each academic year, supervision of Student Forum, at least one annual poster session, and a Program Newsletter.

Article III. Membership in the Committee on Biomedical Engineering

The Committee on Biomedical Engineering consists of tenured (or tenure-eligible) faculty members at the University of Arizona who participate in graduate education and research in Biomedical Engineering. An affiliate membership is available to non-tenure-eligible faculty.

A. Membership

1. Criteria

a. Faculty (tenure-eligible only) shall be nominated for membership in the Committee on Biomedical Engineering by submitting a request for membership and a recent curriculum vita to the Executive Committee. A two-thirds majority of positive votes of the Executive Committee shall be required for nomination to membership to the Director of Graduate Interdisciplinary Programs who shall confer membership. Criteria for membership shall include demonstrated research activity, interest in graduate education, and resources for graduate training.

b. A member of the Committee on Biomedical Engineering shall be dropped from membership for failure to participate in the activities of the Committee. Participation includes service as a thesis/dissertation director for graduate students in Biomedical Engineering, service on a Subcommittee of the Committee on Biomedical Engineering, teaching a graduate course in Biomedical Engineering, giving a departmental seminar on a topic related to Biomedical Engineering, continued scholarly and research productivity in Biomedical Engineering. Membership shall be subject to periodic review and failure to satisfy those criteria as decided by a two-thirds majority of the Executive Committee shall result in loss of membership.

c. Members dropped from membership may reapply for membership as specified in Article III. a.1.

2. Responsibilities

a. Members of the Committee on Biomedical Engineering may serve as academic and research

advisors of graduate students in the program and as members of graduate and other Subcommittees.

b. Members of the Committee on Biomedical Engineering shall meet annually and as needed. Meetings shall be conducted in accordance with Robert's Rules of Order.

c. Each member of the Committee on Biomedical Engineering shall have one vote on matters brought to the Committee by the Executive Committee. A quorum shall constitute one-third of membership. Failing a quorum, a mail vote shall be required.

d. Members shall be listed as Faculty of the Committee on Biomedical Engineering in the Graduate Catalog.

e. Members shall be expected to share in the financial support of graduate students at a level determined by the Executive Committee.

B. Affiliate Membership

1. Non-tenure-eligible faculty who otherwise meet the criteria for membership (Art. III, 1.a.), may apply for affiliate membership in the Committee on Biomedical Engineering by submitting a request for membership and a recent curriculum vitae to the Executive Committee. A two-thirds majority of positive votes of the Executive Committee shall be required for election to affiliate membership.

2. Affiliate members shall have all the privileges and responsibilities of regular members (Art. III, 1.b.) except that they shall only serve as co-directors of graduate dissertation committees in conjunction with a regular member

C. Peer Review Committee

1. Reviews of all faculty members/affiliate members contributions to the IDP will be reviewed annually by the Peer Review Committee, which will consist of at least three Biomedical Engineering faculty members. The Peer Review Committee will be nominated by the Chair of the program and approved by the Executive Committee.

D. Annual Faculty Report/Performance Reviews (IDP)

1. The Annual Faculty Report/Performance Review will be conducted each year, beginning in January. The review period will cover the previous calendar year. The Program office will issue the annual report form to all faculty no later than January 10 of each year. Each faculty member must return the report to the Program office no later than February 1 of each year. The Peer Committee will submit its evaluations to the Chair of the program no later than April 1. A copy of this report will be sent to the Faculty Member’s primary department or academic unit for inclusion in her/his Annual Performance and Post-Tenure Review dossier.

Article IV. Annual Performance Reviews/Promotion and Tenure for Faculty whose tenure lines reside in BME

A. Annual Performance Reviews

1. Annual Performance Reviews for faculty with primary appointments in BME will be conducted in conjunction with the Biomedical Engineering IDP Annual Faculty Report/Peer Review initiated in January. Each faculty member shall submit a report to the Chair of the Program no later than February 1 of each year. This report shall list the goals and objectives for the current reporting period, describe contributions for the previous three years and state goals and objectives for the next reporting year. The report will include summaries of student evaluations for all courses taught during the previous calendar year.

2. Workload Assignments will be formulated and the faculty rated in each of the three primary areas of responsibility - teaching, research/scholarly activity, and service.

   a. Workload assignments will be established annually by the Chair of the Program in consultation with the faculty member. These assignments will take into account the mission of the program and the goals and objectives stated in the annual report. The assignments may vary depending on the current needs of the program, career progression of the faculty and strengths that the faculty bring to the program.

3. Faculty will be rated on a five-level scale: Truly Exceptional, Exceeds Expectations, Meets Expectations, Needs Improvement or Unsatisfactory.

4. Faculty will be evaluated in Teaching by the positive contributions done in classroom teaching; developing course materials; coordinating a course; supervising independent study courses, seminars, graduate and undergraduate student; advising/mentoring graduate students; advising/mentoring postdoctoral associates.

5. Faculty will be evaluated in Research/Scholarly Activity and will be assessed by the quality and quantity of publications in peer-reviewed journals; obtaining grants from outside agencies; invited presentations at local/national meetings in other universities; presentations at national/international meetings; publishing chapters in research-oriented books; honors and awards for research.

6. Faculty Service will be evaluated by the positive contributions in serving on divisional or university committees; chairing any committee; serving in faculty governance (e.g. Faculty Senate); administrative assignments - including the administration of training grants; mentoring other faculty; contributions to interdisciplinary programs; activity in professional organizations and granting agencies; peer review of manuscript/grants for journals and granting agencies; service to other universities - reviewing tenure packages; organizing scientific meetings.

B. Promotion and Tenure Committee

   1. The BME Promotion and Tenure Committee is a standing committee comprised of four tenured BME IDP Members whose rank shall all be above the rank of the individual being considered for promotion, except in the case of full professor, where the

participating committee members shall each be a full professor. Members will be nominated by the Chairman of the Program and approved by the Executive Committee. The Chairman of the Program will be excluded from membership on this committee. This committee will convene to consider 2nd, 4th, 6th year reviews, promotion or tenure. The committee will submit their evaluations to the Chair of the Program no later then April 1 of each year. The committee may also include a faculty member from outside the Program with research interests comparable with those of the individual under consideration. The Committee in consultation with the Chair will select this individual. The opinion of this committee is communicated in a written report to the Chair, who then transmits that report with his own recommendation to the Director of Graduate Interdisciplinary Programs.

C. Promotion and Tenure

1. Decisions regarding promotion and tenure will be made at the intervals prescribed in Chapter 3 of the University Handbook for Appointed Personnel. Assistant Professors will normally be reviewed before the end of the second, fourth and sixth years. These reviews will be carried out separately from the Annual Performance Review and by the Departmental Promotion and Tenure Committee as outlined in IV.B .

2. Biomedical Engineering primary faculty members should contact the program office to receive complete guidelines for the retention review/promotion and tenure process and preparation of dossiers.

Article V. Annual Performance Review/Promotion and Post-Tenure for Chair of BME

A. Annual Performance and Post-Tenure Review of the BME Chair whose tenure line is within a GIDP shall be conducted by the GIDP Advisory Council in compliance with University Handbook for Appointed Personnel guidelines (3.10). The GIDP will consist of six GIDP Faculty Members. GIDP Advisory Council Members will serve three year terms with service staggered such that two new members are added every year as two members fulfill their terms. The GIDP Advisory Council shall be elected by secret ballot from a slate of Faculty Members that have been nominated by the Executive Committee Members of the GIDPs. Elections will be held among Faculty Members of the GIDPs every October.

B. The Chair will submit an Annual Performance report outlining his/her activities as Chair to the Director of Graduate Interdisciplinary Programs. A statement of objectives for the upcoming year should be included. This report must be submitted no later than January 31 of each year and shall cover the period of January 1 through December 31 of the previous year. The previous two years report should be appended in order to provide the three year perspective required by UHAP (3.10.05). This statement shall serve as the primary source of information for the review by the GIDP Advisory Council and the Director of Graduate Interdisciplinary Programs. The assessment of performance shall include an evaluation of both the GIDP Advisory Council and Director of Graduate Interdisciplinary Programs.

C. The GIDP Advisory Council will submit their evaluation to the Director of Graduate Interdisciplinary Programs by April 15. The Director of Graduate Interdisciplinary Programs will meet with the Chair to discuss the evaluation by May 15.

D. Appeals of the Annual Performance Review for non-tenured Chairs will be conducted in accordance with UHAP guidelines (3.10.06).

E. Appeals or Enhanced Reviews of the Annual Performance and Post-Tenure Review for tenured Chairs will be conducted in accordance with UHAP guidelines (3.10.04).

F. The University's Enhanced Review Board will be available to serve for Enhanced Reviews of the GIDP Chairs whose tenure lines are within a GIDP. This will be done in accordance with UHAP guidelines.

Article VI. Amendments

The By-laws shall be amended or revised by movement of the Executive Committee and a two-thirds positive vote of the Committee on Biomedical Engineering.

Last Revision February 11, 2004

Appendix II

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 III

Summary of Courses Available for Graduate Credit

(updated Summer 2000)

Some courses at the 400 level are acceptable for graduate credit with the prior approval of the Graduate College. Courses at the 500 level and above are graduate courses. The asterisk * denotes 400 and 500-level courses with the same number and title which may be convened jointly. Some courses are cross-listed in one or more departments. However, for the sake of clarity, only the primary departmental affiliation of each course is listed. The following list represents course offerings by various departments participating in the Biomedical Engineering Program. However, 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	Units	Semester
Aerospace and Mechanical Engineering (AME)			
563	Finite Element Analysis in Nonlinear Solid Mechanics	3	Fall
566*	Biomechanical Engineering	3	Spring
662	Micromechanics	3	Fall
Agricultural and Biosystems Engineering (ABE)			
508	Environmental Simulation	3	Fall
515*	Engineering of Biological Processes	3	Spring
516*	Simulation of Biological Systems	3	Summer 1 & 2
519*	Engineering Properties of Biol. Materials	3	Fall
547*	Sensors and Controls	3	Fall
Animal Sciences (AN S)			
535	Biotechnology in Animal Science	3	Spring
585	Domestic Animal Endocrinology	3	Fall
Biochemistry (BIOC)			
565	Enzymes	3	Fall
572	Cell Regulation	3	Spring
585	Biological Structure I	4	Spring
Cell Biology and Anatomy (CBA)			
575	Special Topics in Biological Imaging	2	Fall, Spring
Chemical & Environmental Engineering (CHEE)			
554*	Law for Engineers and Scientists	3	Spring
570*	Fundamentals of Polymeric Materials	3	Spring
573	Biodegradation of Hazardous Waste Compounds	2-3	Fall
577	Physiological Basis of Microbial Treatment Processes	3	Fall

Department/

Course number	Title	Units	Semester
CHEE continued			
580*	Bioseparation Techniques for Engineers	3	Spring
581*	Bioreactor Engineering	3	Fall
585*	Biomedical Transportation Phenomena	3	Fall
586	Advanced Biomedical Engineering	3	Spring
Computer Science (C SC)			
570*	Foundations of Artificial Intelligence	3	Fall
Ecology and Evolutionary Biology (ECOL)			
568*	Comparative Physiology	3	Spring
579*	Art of Scientific Discovery	3	Spring
Electrical and Computer Engineering (ECE)			
559*	Fundamentals of Optics for	3	Fall
Electrical Engineers 579*	Principles of Artificial Intelligence	3	Fall
531	Image Processing Laboratory for Remote Sensing	3	Fall
532	Computer Vision	3	Fall
533	Digital Image Processing	3	Spring
541	Synthesis of Control Systems	3	Fall & Spring
548	Adaptive Control Systems	3	Spring
Materials Science and Engineering (MSE)			
503	Applied Surface Chemistry	3	Fall
509*	Transport Phenomena	3	Fall
510	Thermodynamic Characterization of Materials	3	Fall
512*	Physical Chemistry of Materials	3	Fall
523*	Electrochemistry in Materials Science	3	Fall
532	Solid-Fluid Reactions	3	Fall
533	Imperfections in Solids	3	Fall
534	Advanced Topics in Electronic Materials	3	Fall
535*	Corrosion and Degradation	3	Spring
540*	Thermodynamics of Condensed Phases	3	Fall
551	Atomistic Computational Techniques in Materials Science	3	Spring
552	Nondestructive Evaluation of Materials	3	Spring
557	Integrated Circuit Laboratory	3	Fall & Spring
560	Materials Science of Polymers	3	Spring
561	Biological and Synthetic Materials	3	Spring
562	Structure and Properties of Polymers	3	Fall
565	Microelectronic Packaging Materials	3	Spring

Department/ Course number	Title	Units	Semester
(MSE continued)			
570	Technology of Polymers and Ceramics	3	Fall
571	The Formation and Structure of Glass	3	Fall
572	Kinetic Processes in Materials Science	3	Spring
588*	Scanning Electron Microscopy	3	Fall
Mathematics (MATH)			
509	Statistics for Research	4	Fall, Spring
Microbiology and Immunology (MBIM)			
695b	Immunopathology	1	Fall
Molecular and Cellular Biology (MCB)			
511	Topics of Molecular Biology	1	Spring
512	Biological Electron Microscopy	4	Fall, Spring
516*	Bioinformatics and Genomic Analysis	3	Spring
577	Principles of Cell Biology	4	Spring
695e	Science, Society and Ethics	1	Spring
Neuroscience (NRSC)			
582	Topics in Neural Development	2	Fall
584	Cellular Neurobiology	2	Spring
586	Intracellular Messengers	2	Fall
588	Prin. of Cellular & Molecular Neurobiology	4	Fall
589	Principles of Systems Neurobiology	4	Spring
Optical Sciences (OPTI)			
538	Medical Optics	3	Fall
638	Advanced Medical Imaging	3	Spring
Pathology (PATH)			
515	Basic Human Pathology	4	Spring
Pharmaceutical Sciences (PHSC)			
507	Pharmacokinetics	4	Fall
508a	Pharmacokinetics Discussion	1	Fall & Spring
609a,b	Pharmacokinetics	3	Fall & Spring
Pharmacology & Toxicology (PCOL)			
550	Drug Disposition & Metabolism	2	Spring
551	Molecular Biology of Pharmacological Agents	3	Fall
554	Cardiovascular Pharmacology	3	Fall
620	Principles of Pharmacology	3	Fall
653	Neuropharmacology	3	Spring

Department/ Course number	Title	Units	Semester
Physics (PHYS)			
502*	Medical Physics	3	Fall
530*	Introduction to Biophysics	2	Fall
Physiological Sciences (PS)			
503	Cellular and Molecular Physiology	5	Fall
595	Colloquium	1-2	Fall & Spring
601	Systems Physiology	6	Spring
602	Readings in Systems Physiology	1	Spring
610	Research Methods in Physiology	1-3	Fall & Spring
620	Intro to Systems Neurophysiology	2	Spring
625	Human Neuroscience	6	
696	Seminar/Forum	1	Fall & Spring
697	Workshop (tutorials)	3	Fall & Spring
Speech & Hearing Sciences (SP H)			
549	Survival Skills for Students	2	Fall & Spring
Surgery (SURG)			
800	Intro to Surgical Research	1-12	Fall & Spring
815L	Orthopedic Biomechanics/Biomaterials	6	Fall
815F	Orthopedic Surgical Research	3	Fall & Spring
815H	Lymphvascular Sys. Health & Disability	6-12	Fall & Spring
Systems and Industrial Engineering (SIE)			
510	Behavioral Judgement and Decision Making	3	Spring
511	Human Factors & Ergonomic Design II	3	Spring
530*	Engineering Statistics	3	Fall, Spring
551	Modeling Physiological Systems	3	Spring
585*	Robotics and Automation	3	Fall
685	Advanced Topics in Robotics and Automation	3	Spring
Veterinary Science (V SC)			
543*	Research Animal Methods	3	Fall

Appendix IV

Biomedical Engineering Course Requirement Worksheet

Name_____**Date**_____**Previous Degree(s)**_____			
Master of Science		Ph.D./Doctoral	
Required (Hrs)	**Semester**	**Required (Hrs)***	**Semester**
BME 510 (3)		BME 510 (3)	
BME 511 (3)		BME 511 (3)	
BME 516 (3)		BME 516 (3)	
BME 517 (3)		BME 517 (3)	
BME approved Ethics course (1)		BME approved Ethics course (1)	
BME 696A Seminar	----------	Units in the major (18) - List	----------
(2 units, 1 per semester)			
BME 597 Rotation (2 units)	----------		
Advanced coursework (9) - List	----------		
		Units in the minor+ (min. 9) -List	----------
BME 910 Thesis (6) **or** BME 909 Masters Report (3) and additional coursework (3)			
		BME 597 Rotation (3)	----------
Other related units (4)	----------		
		Seminar Courses (6 units min, 8 units max; at least 4 BME 696A)	
		BME 920 Dissertation (18)	
Total = 36	**Total = _____**	**Total = 67**	**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 V

Guidelines for Training, Supervising and Evaluating Graduate Teaching Assistants/Associates

Arizona Board of Regents October 1985 Meeting

At its October, 1985 meeting, the Arizona Board of Regents adopted the following policy:

A. Each university will develop and maintain programs to provide training in basic teaching methods and skills for all graduate teaching assistants and associates.

B. Each university will require that an appropriate regular faculty member formally assess the teaching performance of each graduate teaching assistant and associate every semester and submit a written report of the assessment to the department chair and to the graduate teaching assistant or associate.

C. Each university shall require the department chair or other appropriate administrator to certify in writing that each graduate assistant or associate has clearly demonstrated the high level of oral and written skill in English necessary for effective classroom teaching.

UNIVERSITY OF ARIZONA GUIDELINES

(Approved by the Graduate Council, April 19, 1991)

Academic Eligibility

A. Graduate Assistant
   1. Must be a student currently enrolled in a graduate degree program at The University of Arizona.

   2. Have an admitting GPA of 3.0 or higher if a new student or maintain a 3.00 cumulative grade point average for all University of Arizona graduate credit courses.

B. Graduate Associate
   1. Must be a student currently enrolled in a doctoral degree program at The University of Arizona who has either:
      a. A master's degree; or
      b. 30 units toward the doctoral degree

   2. Have an admitting GPA of 3.0 or higher if a new student or maintain a 3.00 cumulative grade point average for all University of Arizona graduate credit courses.

   3. Retain this status unless converted to a non-doctoral degree program as a Graduate Assistant or change hiring departments. When a Graduate Associate changes hiring departments, it is up to the new department to decide the student's appropriate level.

Appendix VI

Faculty at the University of Arizona with Membership in Biomedical Engineering
(List by Research Interest Areas)

A complete list of BME faculty members can be found on the BME website www.bme.arizona.edu, and their phone numbers and email addresses are available in the UA on-line phonebook.

Bioengineering

Ann Baldwin	(Physiol)	Vascular Transport
Christopher Choi	(ABE)	Computational and Experimental Heat Transfer and Fluid Flow
Joel Cuello	(ABE)	Bioreactor Design for Cell Cultures
Charles Higgins	(ECE)	Robotic Control Systems
Neil Mendelson	(MCB)	Bacterial Genetics, Molecular Biology
Mark Riley	(ABE)	Applied Spectroscopy, Hybridoma Cell Culture, Transport in Cellular Materials
Timothy Secomb	(Physiol)	Microcirculatory Functions - Applied Mathematics
Bruce Simon	(AME)	Biosolid Mechanics (Cardiovascular and Orthopedic Applications)
Dan Stamer	(OPH)	Eye Structure, Trabecular Meshwork

Medical Imaging

Jennifer Barton	(ECE)	Biological Imaging, Medical Instrumentation
William Dallas	(Radiol)	Digital Image Processing
Michael Descour	(OpSci)	Multispectral and Hyperspectral Imaging Systems
Robert Gillies	(BIOC)	Image Processing
Arthur Gmitro	(Radiol)	MRI and Biomedical Imaging
Ron Lynch	(Physiol)	Cell Imaging
Ralph Martinez	(ECE)	Digital X-ray Imaging and Networks
Jeffrey Rodriguez	(ECE)	Optical Coherence Tomography
Jim Schwiegerling	(OPH)	Optical Engineering of Human Visual System
Robin Strickland	(ECE)	Digital Image Processing in Nuclear Medicine and Mammography
Ted Trouard	(BME)	Medical Imaging
Evan Unger	(Radiol)	Diagnostic Imaging, Interventional Radiology, Contrast Media Development, Drug & Gene Delivery
Urs Utzinger	(BME)	Tissue Spectroscopy
Julie Zaetta	(Radiol)	Endovascular Grafts, Medical Imaging

Biomaterials

David Arzouman	(BME)	Cardiac Transplantation, Artificial Heart, Heart Valves
Scott Berman	(BME)	Vascular Implants, Endovascular Grafts
Jay Hoying	(BME)	Biomaterials, Tissue Engineering
Scott Klewer	(Peds)	Atrioventricular Valves
Joseph Mills	(Surg)	Vascular Surgery, Biomaterials, Vascular Imaging
John Szivek	(Surg)	Orthopedic Implants, Mechanical Sensors
Stuart Williams	(BME)	Biomaterials, Tissue Engineering
Julie Zaetta	(BME)	Endovascular Grafts, Medical Imaging

Organ and Cell Transplantation

Francisco Arabía	(Surg)	Cardiac Transplantation, Artificial Heart
David Arzouman	(Surg)	Cardiac Transplantation, Artificial Heart, Heart Valves
Ann Baldwin	(Physiol)	Artificial Blood
Jack Copeland	(Surg)	Cardiac Transplantation, Artificial Heart
Richard Donnerstein	(Peds)	Heart Valves
Jay Hoying	(BME)	Vascular Tissue Engineering
Stuart Williams	(BME)	Biomaterials, Tissue Engineering

Orthopedics and Neurosurgery

Terry Bahill	(SIE)	Expert Systems, Eye-Head Movements
James Benjamin	(Surg)	Orthopedic Implants
Allan Hamilton	(Surg)	Stereotactic Surgery
Bruce Simon	(AME)	Orthopedic Biomechanics, Spine, Internal Fixation
John Szivek	(Surg)	Orthopedic Implants, Mechanical Sensors

Neural Integration

Ara Arabyan	(AME)	Biodynamics, Computer Modeling, Motor Control, (Head Injuries)
Andrew Fuglevand	(Physiol)	Neurophysiology, Biomechanics
Charles Higgins	(ECE)	Robotic Control Systems
Bruce McNaughton	(Psych)	Neuroinstrumentation
John Williams	(AME)	Neural Networks, Intelligent Control

Vascular, Pulmonary and Renal Assist

Scott Berman	(Surg)	Vascular Implants, Endovascular Grafts
Doug Larson	(Surg)	Cardiopulmonary Bypass
Michael Mayersohn	(Pharm)	Pharmacokinetics, Drug Delivery
Joseph Mills	(Surg)	Vascular Surgery, Biomaterials, Vascular Imaging
Bruce Simon	(AME)	Biosolid Mechanics (Cardiovascular Applications)
Stuart Williams	(BME)	Biomaterials, Tissue Engineering

Medical Infomatics

Terry Bahill	(SIE)	Health Information Systems
Ralph Martinez	(ECE)	Digital X-ray Imaging and Networks
Bruce McNaughton	(Psych)	Computational Neuroscience
Brad Story	(SP H)	Bioacoustics, Computer Modeling of Vocal Tract

Glossary of Departmental Acronyms:

AME, Aerospace and Mechanical Engineering; BIOC, Biochemistry; BME, Biomedical Engineering; ECE, Electrical and Computer Engineering; MSE, Material Science and Engineering; OPH, Ophthalmology; OpSci, Optical Sciences Center; Peds, Pediatrics; Pharm, Pharmacy; Physiol, Physiology; Radiol, Radiology; SP H, Speech and Hearing; Surg, Surgery.

Appendix VII

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 VIII

BIOMEDICAL ENGINEERING GRADUATE STUDENT ANNUAL REPORT

Date Submitted: _____ Date 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).

Meeting(s) 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 date(s).

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	
<u>Professional Career Development:</u> 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 IX

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
PO Box 245084
Tucson AZ 85724

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 X

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
	_____
	account number assistance to be paid from

Please attach a copy of your mentor-approved abstract

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

Appendix XI

Biomedical Engineering: Absence Request Form

Date: _____

Name:_____

( ) Vacation
( ) Comp time
( ) Sick (may be completed upon return, if unplanned)
  ( ) Medical appointment
  ( ) Personal illness
  ( ) Family illness
( ) Funeral
( ) 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 XII

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 Chairperson, and the BME program subcommittee are available to assist in resolving student or student/mentor conflicts.

Questions? Please contact:
BME Program Coordinator, Debbi Howard 626-9134
BME GIDP Chairman, Stuart Williams 626-4707