

**DEPARTMENT OF BIOMEDICAL ENGINEERING**  
**THE UNIVERSITY OF ALABAMA AT BIRMINGHAM**

# **GRADUATE STUDENT HANDBOOK**

**2014-2015**



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# 1 Introduction

## 1.1 Welcome to the Department of Biomedical Engineering (BME)

Welcome to the Department of Biomedical Engineering (BME) at the University of Alabama at Birmingham. We are excited that you have chosen UAB to pursue your advanced degree. The mission of the BME Department is to prepare graduates to succeed in the evolving fields of biomedical engineering and biotechnology and to improve health care by making scientific discoveries, solving problems and advancing technology using quantitative methods. The faculty and staff of the BME Department look forward to working with you as you pursue your advanced degree. We hope this handbook will provide information that helps achieve your educational goals.

The Department of Biomedical Engineering was established at UAB in 1979 and the Master of Science degree was approved. The Ph.D. degree was approved in 1983. The B.S.B.M.E. degree was approved in 2001 and was accredited by the Accreditation Board for Engineering Technology in 2007. Today, the BME Department consists of 13 full-time primary faculty members, three dedicated staff members, 43 graduate students and 156 undergraduate students. BME is one of five engineering departments in the School of Engineering along with Civil, Construction and Environmental Engineering; Electrical and Computer Engineering; Materials Science and Engineering and Mechanical Engineering. BME is highly interdisciplinary with strong collaborations with faculty members in the School of Dentistry and the School of Medicine, both located on the UAB campus in Birmingham.

The BME faculty is committed to excellence in teaching, research service and mentorship. Faculty research focuses on biomaterials, biomechanics, biomedical imaging, biomedical implants & devices, cardiac electrophysiology, computational biology, biomedical optics, tissue engineering and regenerative medicine. The BME Department has organized its research and training programs into four focus areas: biomedical imaging, biomedical implants and devices, cardiac electrophysiology and tissue engineering and regenerative medicine. Annual research expenditures in the department exceed \$2 million. BME faculty members and students collaborate with engineers, scientists and clinicians in Dentistry, Engineering, Arts & Sciences, and Medicine as well as interdisciplinary centers including the BioMatrix Engineering and Regenerative Medicine Center, the Center for Metabolic Bone Diseases, the Center for Cardiovascular Biology, the Vision Sciences Research Center, the Comprehensive Cancer Center, Civitan International Research Center, and the Center of Nanoscale Materials and Biointegration. Currently, over 40 UAB scientists and engineers are working collaboratively with BME faculty and students to develop the next generation of biomedical engineering technologies, systems and devices. UAB has professional relationships with over 90 Alabama biomedical companies through the Biotechnology Association of Alabama. In some cases, these relationships provide opportunities for BME graduate students to work on projects of interest to industry through collaborations, internships, or partnerships. Research in the BME department has led to invention disclosures, patents and formation of several companies.

Since its inception in 1979, the BME Program has awarded 86 Ph.D. degrees, 278 M.S. degrees and 138 B.S.B.M.E. (started in 2001) degrees. BME graduates hold positions in biomedical device, imaging and technology companies, academic institutions, hospitals, professional practices, and governmental agencies. UAB BME graduates are involved in research, product development, sales, health-care delivery, regulatory affairs, design, teaching and business development and entrepreneurship.

The Department of Biomedical Engineering is in an exciting growth phase. Since 2006, we have hired five new faculty members. Our recruiting has focused on biomaterials, biomechanics, computational biology, biomedical imaging, drug delivery and tissue engineering and regenerative medicine. Based on our departmental and institutional strengths, we will continue to provide an interdisciplinary and multidisciplinary research and educational program in collaboration with colleagues in Dentistry, Medicine, Engineering and the College of Arts & Sciences.

Graduate school is a place to expand the breadth and depth of your knowledge and enhance your research skills to the highest level. At UAB, you will work with talented students and faculty in state-of-the-art laboratories to develop research, administration and critical thinking skills necessary to achieve your goals. This is an exciting time. I encourage you to work hard and expand your knowledge, but most of all to have fun. You are ultimately responsible for the quality of your work, progress towards your degree and your career development. Our faculty, staff and students will offer guidance and support.

I wish you continued success in your education; I look forward to learning of your accomplishments. We welcome you as a colleague and a partner in the Department of Biomedical Engineering

Timothy M. Wick, Ph.D.  
Professor and Chair  
Department of Biomedical Engineering

## **1.2 General Information and Points of Contact**

The purpose of this document is to outline the policies, procedures and milestones for the M.S.B.M.E. and Ph.D. degrees in Biomedical Engineering. This document should be used by students in the BME Graduate Program for guidance in their graduate studies, and by advisors in advising students on the various required milestones in each of the degree programs.

At UAB, the School of Engineering shares the same physical campus with the UAB Medical Center, which has world-wide recognition for its excellence in biomedical research and patient care. The BME Program at UAB has its home in the Department of Biomedical Engineering within the School of Engineering; however, faculty throughout the Medical Center and other parts of the university participate in the program and hold joint or adjunct faculty appointments in Biomedical Engineering. The UAB BME Program currently offers four broad areas of specialization: biomedical implants and devices, biomedical imaging, cardiac electrophysiology and tissue engineering and regenerative medicine. Each of these areas has particular requirements for the M.S.B.M.E. and Ph.D. degrees. Common to each is a core set of courses. Also each research specialty has its own courses. Students not only take specialty courses in BME, but they also take courses throughout the university that are appropriate to their Degree Plan. Your Research Advisor and the BME Graduate Program Committee will work with you to tailor an individualized Degree Plan for you based on your research project and career aspirations.

In addition to this handbook, the Graduate Program Director and the BME administrative staff members are available to provide assistance and guidance in day-to-day operation of the BME Department and the graduate program.

**Vladimir Fast** (Associate Professor and BME Graduate Program Director, Volker Hall B132, (205) 975-2119, [vfast@uab.edu](mailto:vfast@uab.edu)) works with the Graduate Studies Committee and the UAB Graduate School to develop and administer the graduate programs and policies of the BME Department. **Dr. Fast will sign your forms, approve your Degree Plan, and provide other assistance as you reach the milestones toward your degree.**

**Mindy Robbins** (BME Graduate Program Administrator, Shelby 801, (205) 996-6936, [minrob@uab.edu](mailto:minrob@uab.edu)) provides administrative support for the BME Graduate Program. **She is your primary contact for all questions related to the BME Graduate Program, including tuition and payroll questions.** All required BME Program documentation and forms must be submitted to the BME Graduate Program Administrator.

**Sheryl Blackwell** (Business Officer, Shelby 801, (205) 934-3947, [sherylb@uab.edu](mailto:sherylb@uab.edu)) is the financial Administrator for BME. She administers the department finances, including the approval of processed orders and reimbursements. **Sheryl is your best contact for assistance with purchasing and lab supply questions.**

**Julie Calma** (Hoehn 361, (205) 975-4944, [jcalma@uab.edu](mailto:jcalma@uab.edu)) provides administrative assistance to the BME undergraduate program. She can assist with course registration through BANNER, including setting up courses for research credit hours, will schedule rooms for committee meetings and other activities in the Hoehn Building or the Business and Engineering Complex.

**Brenda Dudley** (Office Associate II, Volker Hall B140, (205) 975-4710, [wansersk@uab.edu](mailto:wansersk@uab.edu)) provides administrative assistance to the BME faculty and students in the Cardiac Rhythm Management Laboratory in Volker Hall. Brenda will schedule rooms for committee meetings and other activities in the Volker Hall.

**Graduate Program Committee.** The BME Graduate Program Committee is responsible for administering the BME Graduate programs as envisioned by the BME faculty and consistent with policies and procedures in the UAB Graduate School and the School of Engineering. The committee recommends students for admission into the BME Graduate Program, approves Degree Plans and thesis committee memberships, and provides guidance to students in the program. The committee consists of the following members; any of who are available to assist you when questions arise:

- Dr. Vladimir G. Fast, Associate Professor, Graduate Program Director, Graduate Committee Chair
- Dr. Timothy M. Wick, Professor, Department Chair
- Dr. Allan C. Dobbins, Associate Professor
- Dr. Ho-Wook Jun, Associate Professor
- Dr. Palaniappan Sethu, Associate Professor
- Dr. Xincheng Yao, Associate Professor

**Other key personnel in the School of Engineering include:**

**Tommy Foley** (Director of Information Technology, Hoehn 351, (205) 934-8477, [tfoley@uab.edu](mailto:tfoley@uab.edu)) provides IT and technical support for the School of Engineering and UAB computer systems, maintenance of computer labs, maintains security of computers in SOE, and distribution and installation of software licensed to UAB. Tommy is assisted by Gregory Myers ([gmyers@uab.edu](mailto:gmyers@uab.edu)) and Tyran Kirkland ([tkirkland@uab.edu](mailto:tkirkland@uab.edu)). SOE computer

support is best obtained by contacting the School of Engineering's Help Desk staff at <https://uabweb.ad.uab.edu/eng/HelpDeskNew/default.aspx>.

**Karen King** (Associate Director, Career and Professional Development Services and Liaison to the School of Engineering, Hill University Center 532, (205) 934-3426, [ksking@uab.edu](mailto:ksking@uab.edu)) is a resource for career planning and advising. Karen is a resource for BME Graduate students seeking career advice and networking opportunities. Karen engages engineering students in the career development process of exploring career options, gaining experience in a chosen field, preparing for the job search, and succeeding in their career goals. Karen provides a comprehensive employment program to bring employers and students together and serve as a catalyst for campus recruiting.

### 1.3 Sources of Information

This Handbook covers matters of particular concern to students in the BME Graduate Program. It supplements the information contained in the UAB Graduate Student Handbook, which presents policies and regulations for all graduate students at UAB. All BME graduate students must carefully read both the UAB Graduate School Handbook and the BME Graduate Program Handbook.

The UAB Graduate Student Handbook is available at [http://www.uab.edu/graduate/images/acrobat/publications/UAB\\_Grad\\_Handbook.pdf](http://www.uab.edu/graduate/images/acrobat/publications/UAB_Grad_Handbook.pdf)

The BME Graduate Program Handbook is available at <http://www.uab.edu/engineering/home/graduate-programs/bme-graduate-program-documents>

Other important sources of information:

- The Graduate School website (<http://www.uab.edu/graduate/>). General graduate information, guidelines, and regulations.
- The UAB Graduate Catalog (<http://www.uab.edu/graduate/graduate-catalog>). General graduate information, guidelines, and regulations
- The Graduate School Deadline Dates (<http://www.uab.edu/graduate/deadline-dates>)
- The Graduate School Forms (<http://www.uab.edu/graduate/online-forms>)
- The UAB Thesis and Dissertation website (<http://www.uab.edu/graduate/theses-and-dissertations-at-uab>). Instructions for preparation, formatting and submission of theses and dissertations
- Information on UAB's Student Health Services (<http://www.uab.edu/studenthealth/>)
- UAB Occupational Health and Safety (<http://www.uab.edu/ohs/>). General information on health and safety, laboratory and chemical safety, biohazards, radiation safety
- The BME Graduate Program website (<http://www.uab.edu/engineering/home/graduate-programs>)
- The BME Graduate Program Documents website (<http://www.uab.edu/engineering/home/graduate-programs/bme-graduate-program-documents>). Degree plans, forms and templates

Familiarize yourself with UAB, Graduate School and BME Department policies and procedures early in your graduate career to facilitate a smooth and timely transition through graduate school. If you have a question that neither of these sources resolves, please contact:

Mindy Robbins ([minrob@uab.edu](mailto:minrob@uab.edu))  
Graduate Program Administrator  
Department of Biomedical Engineering  
University of Alabama at Birmingham  
801-C Shelby Bldg, 1825 University Blvd  
Birmingham AL 35294-2182  
(205) 996-6936 (office)  
(205) 975-4919 (fax)

## **2 Student Activities, Financial Aid and Support**

### **2.1 Biomedical Engineering Society (BMES) Student Chapter at UAB**

The goal of the BMES student chapter is to introduce students to the profession of Biomedical Engineering. We provide an environment for social interaction and exchange of ideas between students and faculty. Activities include social events, intramural sports teams, participation in Engineering Open House, production of a student newsletter (the BMENews), and volunteer opportunities throughout greater Birmingham. Social interactions include outings to sporting and cultural events, charitable fundraising efforts, bowling nights, picnics and cook-offs, nature activities, and intramural sports. For professional development, the BMES student chapter provides an opportunity for BME students to network and meet with faculty and professionals from health care and related industries and health-care providers to learn about various opportunities in the field.

#### **Faculty Advisors**

Dale S. Feldman, Ph.D.  
Phone: (205) 934-8426  
email: [dfeldman@uab.edu](mailto:dfeldman@uab.edu)

Joel L. Berry, Ph.D.  
Phone: (205) 996-9661  
email: [jlberry@uab.edu](mailto:jlberry@uab.edu)

#### **Membership Criteria**

Student membership is open to anyone pursuing a course of study in BME or a related science. Annual dues are \$25.00 with \$20.00 going to the national organization. Member benefits include free subscription to the quarterly BMES Bulletin, member rates on subscription to the Annals of Biomedical Engineering, discounts on registration fees at BMES meetings, subscription to the BMENews (the UAB BMES Newsletter), and invitations to social events.

#### **Meeting Information**

Executive Committee Meetings are held monthly as are member-wide Chapter Meetings (held in conjunction with BME Seminars). Notices for all meetings and events are posted on the BME Web Calendar, the BMES Web Page, and distributed via e-mail to all members.

#### **Contact**

Send e-mail at [dfeldman@uab.edu](mailto:dfeldman@uab.edu). Applications are available in the BME Office (Hoehn 370). Additional information, calendar of events and job listings are posted on the BME website <http://uabbmes.googlepages.com/>.

## **2.2 Society for Biomaterials (SFB) Student Chapter at UAB**

UAB was one of the founding members of the SFB national student organization, having one of the first local chapters in 1989, and supplied the first few presidents of the national organization. Although it is open to all majors, the goal of the organization is to provide both a social outlet and a means of disseminating professional information to those interested in biomaterials. The student chapter of SFB represents UAB at the annual meeting during the Society for Biomaterials conference.

### **Faculty Advisor**

Dale S. Feldman, Ph.D.

Phone: (205) 934-8426

email: [dfeldman@uab.edu](mailto:dfeldman@uab.edu)

### **Membership Criteria**

Student membership is open to anyone pursuing a course of study in BME or a related science.

### **Meeting Information**

Notices for all meetings and events are posted on the BME Web Calendar, the BMES web page, and distributed via e-mail to all members.

### **Contact**

Send e-mail at [dfeldman@uab.edu](mailto:dfeldman@uab.edu)

## **2.3 Biomedical Engineering Graduate Student (BMEGS) Organization**

The Biomedical Engineering Graduate Student (BMEGS) Organization was developed from a shared interest among BME graduate students and BME faculty to provide graduate students a greater voice in all aspects of the BME Graduate Program. BMEGS was conceived and developed by a number of graduate students in 2009 and became an officially recognized UAB student organization in November of that year. The purpose of BMEGS is to facilitate cohesive communication between BME graduate students and faculty members and allow opportunities for the students to be active in management and development of the Biomedical Engineering Graduate Program through increased interdepartmental collaborations and external outreach programs. BMEGS is organized into committees for each of the organization's focus areas: professional development and networking, intramural/recreational sports, social activities, and community service/fundraising.

BMEGS is active in graduate student recruitment and new graduate student orientation. Their leadership and involvement in these activities have increased success in recruiting the best students into BME at UAB. Professional development activities include a BMEGS-run graduate student summer seminar series, tours of local biotechnology companies and hosting several seminar and department visitors. Ongoing projects within BMEGS include creating a curriculum for a new BioDesign course, developing an alumni network, and volunteering with Habitat for Humanity and local food shelters. BMEGS has also fielded competitive softball and soccer teams that compete in the UAB intramural sports program.

Contact the BME Graduate Program Office for names of current BMEGS officers.

## **2.4 Financial Support**

A Graduate Research Assistantship (GRA) funded through a faculty member's research grant or contract typically supports the graduate students in the BME Department. Ph.D. students on a GRA receive a competitive monthly stipend, plus tuition, fees and single-coverage health insurance in exchange for work on a research project, usually their thesis. The BME program will only pay for single coverage VIVA UAB health insurance. The research advisor usually funds a GRA from a research grant or contract. The BME Department has limited resources to fund GRAs, Graduate Teaching Assistantships (GTA) or Fellowships. Students on a GTA receive a monthly stipend, plus tuition and fees in exchange for assistance teaching a course or laboratory at UAB. Specific requirements and expectations are defined by the instructor with whom the student is working.

At the discretion of the BME Graduate Program Committee and subject to funding from the UAB Graduate School, some first-year doctoral students are funded by a Graduate Assistant Fellowship Program (GAFFP). These fellowships are not subject to Federal withholding tax. In addition, tuition is paid directly to the Student Accounting office for students appointed to GAFFPs. All other forms of stipend support are taxable.

For students funded from grants, the Principal Investigator, who is usually the student's thesis advisor, defines the requirements and expectations for a GRA. Research is the main component of graduate education, and thus students must put in the time necessary to make measured progress on their research project. Students are expected to spend a minimum of 40 hours per week on course work and research leading to the BME degree being pursued. Most students find that they put in more than the minimum number of hours per week to meet deadlines and graduate on time.

In order to be eligible for full financial support, a student must register for 27 semester credit hours each year (Fall, Spring and Summer semesters). This can be a combination of courses, BME seminar, and research credit hours. Students receiving stipends are expected to register only for courses that are directly related to their degree. The BME Department will not pay any late fees so make sure you register for classes in a timely manner.

The School of Engineering offers a limited number of Engineering Scholars awards based on academic achievements of incoming students. This award is used to supplement the financial support offered by the BME Department. Eligible students are nominated by the BME Graduate Committee and approved by the Dean of the School of Engineering. Only U.S. Citizens are eligible for the Engineering Scholars awards. Students are notified of an Engineering Scholar Award at the time of admission to the BME Graduate Program. Students cannot directly apply for these scholarships.

### **2.4.1 Fellowships**

All graduate students are encouraged to apply for a graduate fellowship, assistantship, or scholarship to support their graduate studies. A number of government agencies, private foundations, and professional societies that have predoctoral (and postdoctoral) fellowships are listed in Appendix B. Your Research Advisor and the BME Graduate Program are willing to help you prepare a competitive fellowship application. In addition, the UAB Graduate School offers financial incentives to students who apply for and are awarded individual fellowships to support

their predoctoral studies. Details, eligibility criteria, as well as a partial list of fellowship opportunities are in Appendix B. Additional information can be obtained from the UAB Graduate School website (<http://www.uab.edu/graduate/area-3/current-students/90-funding-information-for-graduate-students>).

## 2.5 Vacation Policy

In general, graduate research assistants and trainees are expected to be available in the periods between academic terms. Graduate research assistants and trainees are entitled to the following short-term leaves:

- a maximum of 15 calendar days (one-half month) paid leave of absence (vacation) per calendar year,
- 3 calendar days paid sick leave of absence per calendar year, and
- parental leave of absence (with pay) of 30 consecutive days per calendar year upon the birth or adoption of a child. Either or both parents are eligible for parental leave.

These leaves (vacation, sick, parental) do not accrue. All leaves require notification of and approval by the mentor or Graduate Program Director and may be extended, if necessary, with the permission of the Graduate Program Director. With the agreement of the mentor and Graduate Program Director, extended, unpaid, non-emergency absences from campus for periods up to a month may be approved. Extended absences (without pay) for non-academic purposes should be limited. Students should consult the Graduate School Policies and Procedures concerning leaves of absence. In emergencies, graduate research assistants and trainees should inform their mentors or program directors as soon as possible about the need for a leave of absence.

Read the UAB Graduate Student Handbook for more detailed information.

## 3 Academic Programs

### 3.1 Statement on Academic Conduct and Academic Integrity

Academic misconduct undermines the purpose of education. Such behavior is a serious violation of the trust that must exist among faculty and students for a university to nurture intellectual growth and development. The BME faculty holds academic integrity as one of the highest characteristics necessary for success in graduate school. Students in BME are expected to abide by the UAB Academic Honor Code and at all times avoid engaging in behavior that is or that may be perceived as academic dishonesty. Academic dishonesty includes, but is not limited to the following categories of behavior:

**ABETTING:** Helping another student commit an act of academic dishonesty. Allowing others to copy your quiz answers, or use your work as their own are examples of abetting.

**CHEATING:** The use or attempted use of unauthorized materials, information, study aids, the answers of others, or computer-related information.

**PLAGIARISM:** Claiming as your own the ideas, words, data, computer programs, creative compositions, artwork, etc., done by someone else. Examples include improper citation of referenced works, use of commercially available scholarly papers, failure to cite sources, copying other's ideas, work or computer programs.

FABRICATION: Presenting as genuine falsified data, citations, or quotations.

MISREPRESENTATION: Falsification, alteration or misstatement of the contents of documents, academic work or other materials related to academic matters, including representing work substantially done for one class as work done for another without receiving prior approval from the instructor. Misrepresentation also includes misrepresenting schedules, prerequisites, transcripts, or other academic records.

Violations of the Academic Conduct are punishable by a range of penalties from receiving a failing grade on an assignment or examination to failing the course. Any course grade of F for academic misconduct supersedes any other grade or notation for that class.

More information on Academic Ethics and Conduct is available in [the UAB Graduate Student Handbook](#)

### 3.2 Registration

1. Upon entry into the program each student will receive a user ID (called your Blazer ID), an official UAB e-mail address and computer account. Your UAB e-mail address will be used for all official correspondences from the department and the university. You should not forward your UAB e-mail to another account (hotmail, gmail, etc.). All students are expected to read their e-mail several times a week to receive announcements and notices. Students are responsible for reading and responding to all UAB and BME Program messages in a timely manner.
2. **To register for courses, please sign in to BlazerNET** (<http://www.uab.edu/blazernet>). Access to BlazerNET requires a BlazerID and password. Once logged in to BlazerNET, click on the Student Resources tab. On the Student Resources tab, see a channel entitled "Registration Tools." All the tools you need to register are available as links within this area.

#### **To look up the Course Reference Number for your course(s)**

Click on the "Look Up Classes" link to search the available courses for the term. You may search for classes with several different criteria, but the only block that must be utilized is the *Subject* block. Once the classes are visible, register for the course(s) by clicking on the empty checkbox to the left of the CRN and clicking on the Register button at the bottom of the screen.

#### **If you already know the CRN for your course(s)**

Click on the "Add/Drop Classes" link in the "Registration Tools" channel. The Add/Drop worksheet will appear. There will be a row of empty blocks. Type in the five-digit CRN for your course in any of the blocks. If you are registering for more than one course, tab over to another block and enter in all of the courses at one time. (You do not need to type in the subject or number for the course, only the CRN is required!) Click on the *Register* button at the bottom of the screen when complete.

#### **To verify that you have successfully registered**

If you would like a Registration Confirmation, click Registration Confirmation in the "Registration Tools" channel. If you would like to see your classes in a schedule format, follow these steps: On the Student Resources tab, click on the link "Banner Self-Service."

Click on *Student and Financial Aid*. Click on *Registration*. Click on *Student Detail Schedule or Week at a Glance*.

3. Each student receiving a stipend, fellowship or assistantship must register for 27 hours per year (typically, 9 semester hours per term) except where this requirement is superseded by the Graduate School requirements. This can be a combination of course work, BME seminar and research credit hours. Students receiving a stipend cannot accept outside employment. In rare instances where a student has completed all of the thesis or dissertation defense requirements and is not on campus, but must be registered in order to graduate in their final semester, the student may register for only one credit with the permission of the BME Graduate Program Director and the Graduate School Dean. This is a one-time only exception; there are no other exceptions to these policies.
4. M.S. students are required to register for 3 semesters of graduate seminar (BME 601) in order to graduate. Ph.D. students are required to register for 3 or 6 semesters of graduate seminar (BME 701), depending on the Ph.D. program track. The seminar program features experts from industry, academia, and government who discuss innovative research, new technology development, regulatory requirements, and industry trends and perspectives that impact health care, biomedical engineering and biotechnology. Interacting with the speaker as well as BME faculty members, BME graduate students and other colleagues at the seminar is an important opportunity to participate in the BME community and expand your horizons. Graduate students are allowed to miss up to two seminars in a term without penalty to allow some flexibility for unanticipated research problems or opportunities, travel to a meeting or other research-related event or other unforeseen emergencies. All M.S., Ph.D., M.D./Ph.D. and D.M.D./Ph.D. students are expected to attend the seminars each semester, regardless of whether they are registered to take seminar for credit. Journal Club meetings are held in a number of biomedical engineering specialties. Ask your Program Advisor for an appropriate Journal Club to attend.

### 3.3 English for International Students

International graduate students (those who were required to submit TOEFL or IELTS scores) entering the BME Graduate Program are required to take an English Academic Language Assessment within the first two weeks at UAB. The UAB Graduate School's Professional Development Program administers the assessment. The purpose of the assessment is to identify your current level of academic English proficiency and to provide you with the appropriate language support for a successful experience at UAB.

Your English Language Assessment scores will be sent to you and the BME Program Director for advising purposes. Based on these scores, one or more writing or speaking English courses may be recommended by the Graduate School to assist you in your graduate training and professional development. The English academic writing and speaking courses do not count toward a BME graduate degree and do not count as part of the 27 semester hours you are required to take each year. The cost of tuition for the English academic writing and/or speaking course(s) is the responsibility of the student.

### 3.4 Academic Performance Requirements

Students must maintain an overall GPA of 3.2 to remain in good academic standing in the BME Graduate Program. If a student fails to meet the criteria for good academic standing at the end

of any semester, the student will be placed on probation. Such a student must re-establish good academic standing within the next two semesters. Students who do not accomplish this level of performance will be dismissed from the Graduate Program.

The BME Graduate Program requires that each student selects a research advisor and formulates a preliminary degree plan by the end of the first semester of graduate study. If this requirement is not fulfilled, the student might be dismissed from the Graduate Program.

Each student has to form a Thesis or Dissertation Committee and hold its first meeting within the second semester. After that, the Dissertation/Thesis Committee must meet at least annually (for Ph.D.) or semi-annually (for M.S.) to review the student's progress. After each meeting, submit a brief progress report signed by the Committee Chair to the BME Program Administrator. Report templates are available on [The BME Graduate Program Documents](#) website. If the progress is considered to be unsatisfactory, the Committee should implement a plan to improve student's performance within the next six months.

Each student has to submit an annual (Ph.D.) or semi-annual (M.S.) progress report. Report templates are available on the BME Graduate Program Documents website. The deadline for a report is the last day of classes of spring semester (Ph.D.) or spring/fall semesters (M.S.). If the requirements for timely committee meetings and submission of progress reports are not met, such a student will be placed on probation and will have to fulfill these requirements within the next semester. If they are not fulfilled, the student will be dismissed from the Graduate Program.

Each student is responsible for following milestones, meeting the deadlines, arranging their committee meetings, and submitting all required documentation for your degree program to the BME Graduate Program office and the UAB Graduate School. If you are unsure about the milestones in your degree program, ask your advisor, or the BME Graduate Program Administrator. [The Graduate School Deadline Dates](#), forms and instructions are posted on the Graduate School Website.

Unless otherwise stated, all forms and documents, including those ones that require signature of the BME Program Director, have to be submitted to the BME Graduate Program Administrator.

### **3.5 Thesis and Dissertation**

M.S.B.M.E. and Ph.D. students are expected to submit a high-quality thesis or dissertation available to the public that excels technically and meets high standards for structure, grammar, and writing style that conform to the requirements of the UAB Format Manual for Theses and Dissertations ([The UAB Thesis and Dissertation website](#)). In the event that the thesis/dissertation does not meet the quality standards established by the BME Department and the Graduate School, the mentor or Graduate Program Director may require review by an external editor. The expense for editing is the responsibility of the student, although the mentor may support it from research funds at her or his discretion.

The BME Graduate Program Director is required to review each student's thesis or dissertation before it is submitted to the Graduate School. To allow adequate time for review, submit the final copy, approved by the thesis/dissertation committee, in electronic form (PDF or Word file) to the BME Graduate Program Director at least 5 business days before it is due to the Graduate School.

The UAB Graduate School and the BME Department aspire to ensure that all graduate students can communicate effectively and prepare written reports (theses, dissertations, manuscripts, etc.) to the highest ethical standard. Refer to the UAB Graduate Handbook for definition of plagiarism and guidance to avoid incidences of plagiarism. Each thesis and dissertation will be submitted to Turnitin to check the documents for originality. The results of the originality report will be shared with the student who, along with the Research Advisor and Graduate Program Director, will determine whether any parts of the thesis need to be rewritten to conform to the norms of good scientific writing and proper citation of source material.

Instructions for submitting your thesis or dissertation to the UAB Graduate School can be found at [The UAB Thesis and Dissertation website](#). Note that the BME Department deadline above requires that you complete your thesis or dissertation well in advance of the Graduate School deadlines. An electronic copy should be sent to the BME Program Administrator.

If you would like to have bound copies of your thesis or dissertation, Sterne Library can handle that process for you. Students are expected to pay for the copying, although some assistance may also be available through the Graduate Student Association or from your advisor. Information on ordering bound copies of your thesis or dissertation can be found here: <http://www.uab.edu/graduate/ordering-bound-copies>.

### **3.6 Time Limitations**

BME graduate students are expected to complete their degree requirements within

- 2 years for M.S.B.M.E. degree
- 5 years for Ph.D. degree if starting with a B.S.
- 4 years for Ph.D. degree if starting with an M.S.B.M.E.

In the event that a student exceeds the time limit, the student must submit a written petition to the BME Graduate Committee for continued funding. The petition should include:

- Explanation of specific reasons for the delay in completion of the degree
- A “Completion Plan” which will outline specific goals, deadlines for meeting these goals, and a stipulation that the student will meet with his/her committee to review progress at each of the proposed deadline times. It is recommended that the time intervals between proposed student’s committee meetings be no longer than 3 months (MS) or 6 months (PhD). The plan should be signed by the student and his/her advisor.
- A letter from the student’s advisor with a strong endorsement for continuation and assurance for funding availability

### **3.7 The Program for the Master of Science in Biomedical Engineering (M.S.B.M.E.)**

#### **3.7.1 Requirements for the M.S.B.M.E. Degree**

The BME Graduate Program offers Plan I (thesis-based) M.S. degree that requires completion, in good academic standing, of at least 30 semester hours of appropriate graduate work, public presentation and defense of a written thesis embodying the results of original student’s research, and publication or submission of at least one original research article in a peer-reviewed journal, in which the student is expected to be the first author.

The following are general guidelines for M.S.B.M.E. students:

1. The 30 credit hours of graduate-level work for Plan I M.S. degree include
  - 24 semester hours of course work prior to candidacy including:
    - core courses (total of 9 credit hours):
      - BME 517 Engineering Analysis or ME 661 Math Methods in Engineering (these courses are taught interchangeably depending on the year).
      - BST 621 Statistical Methods I.
      - BME 670 Quantitative Physiology.
    - elective courses (total of 12 credit hours) should be a combination of BME, engineering, math or life science classes that provide sufficient breadth and depth to gain the necessary graduate-level, interdisciplinary knowledge to complete thesis research. The elective course selection must include at least one BME course and one life science course. Up to 3 credit hours of elective course work can be taken as non-thesis research (BME 698) or directed independent study approved by the Graduate Program Committee.
    - BME seminar BME 601 (3 credit hours)
  - 6 hours of thesis research BME 699 taken after admission to candidacy.

English speaking or writing proficiency courses for international students recommended as a result of the Graduate School assessment (described above) do not count as part of the 24 credit hours of graduate course work required for the M.S.B.M.E. degree.

2. The BME Graduate Program Committee or the BME Graduate Program Director must approve all substitutions. It is emphasized that 30 hours is a minimum requirement and most students complete more hours than this minimum while earning the M.S.B.M.E. degree. Additional course work requirements are based on the student's background and thesis topic and are developed on an individual basis in consultation with the student's research advisor and the Graduate Program Director.
3. The Graduate School requires that a student must be admitted to candidacy before they can register for BME 699. This means you cannot register for BME 699 and accrue the required number of thesis hours until you have completed your research proposal presentation. This is another reason why you must not wait until you are almost finished with your thesis or project to present your research proposal.
4. The Graduate School requires admission to candidacy to take place at least one semester before the graduation date in the case of the M.S. degree. Present your proposal and achieve candidacy well in advance of your planned graduation date!
5. The time limit for completion of Master's degree is 2 years. Continuation beyond this time limit requires a petition to the BME Graduate Program Committee (see section 3.6).

### **3.7.2 M.S.B.M.E. Milestones**

The following are required milestones in the M.S.B.M.E. program.

## 1. Selecting Research Advisor

Each student has to identify a Research Advisor by the end of the first semester of graduate program. It is a student's responsibility to choose a Research Advisor. This person must agree to accept you as a student.

If the Research Advisor holds a primary appointment in BME, this person will also serve as the Program Advisor. If the Research Advisor is not a primary BME faculty member, then

- complete a Mentor Selection Form ([The BME Graduate Program Documents](#)) and submit it to the BME Program Administrator.
- select a Program Advisor from faculty with a primary appointment in BME. The Program Advisor will serve on the thesis committee and will ensure that the student meets requirements for the M.S.B.M.E. degree.

## 2. Formulating Degree Plan

The Research Advisor will help you to identify your thesis project and formulate a Degree Plan. The Degree Plan lists all core and elective courses the student is expected to take for the degree. Degree Plan forms as well as Degree Plan Guidelines can be downloaded from [The BME Graduate Program Documents](#) website. The BME Graduate Program Committee must approve the Degree Plan. You should keep a copy of the Degree Plan and use it as a guide for registering for courses. Changes in the Degree Plan will be made in consultation with the student's Research Advisor and Program Advisor, or in some cases with the student's Graduate Thesis Committee. The preliminary Degree Plan must be completed during the first semester of your program. Changes to the Degree Plan must be approved by the BME Graduate Program Committee.

## 3. Selecting Graduate Thesis Committee

Graduate Thesis Committee must be selected by the end of the second semester in the BME Program. Fill out a Graduate Study Committee Letter ([The Graduate School Forms](#)), submit it for approval to the BME Graduate Program Administrator. After that, submit the Letter to the UAB Graduate School. If there is ever a change in your Graduate Study Committee, a Change of Graduate Study Committee form must be filled out and turned in to the Graduate School.

Your Thesis Committee should have a minimum of three persons including your Research Advisor. Your Research Advisor can help you in selecting Committee members. It is required that at least one (1) Committee member has a primary appointment in BME and one member has an appointment outside BME. It is preferred that the majority of the Committee be comprised of BME primary faculty. Each committee member should be able to bring some relevant expertise to guide your research.

Any committee member, who is not already appointed to the UAB graduate faculty, has to be appointed as an ad hoc committee member. The procedure for requesting *ad hoc* appointment can be found at <http://www.uab.edu/graduate/gradfaclist>. The request should be sent to the Dean of the Graduate School as a single PDF file containing (i) a letter of nomination from the student's advisor, (ii) a completed Recommendation for Appointment to Graduate Faculty form, and (iii) the applicant's current CV. A copy of the file should be also sent to the BME Program Administrator.

It is up to you to contact each faculty member whom you select to serve on your Thesis Committee, and explain to them the nature of the proposed research. Faculty members are not required to serve on a student's Committee. Most faculty members will agree to serve on a Committee if they are not already over committed.

An initial meeting with their Graduate Thesis Committee must be held before the end of the second semester in the M.S.B.M.E Program. The first committee can be fairly informal with the purpose for the student to get to know the committee members, and for the committee members to learn about the area of study for the thesis, about the project outline and broad goals. The student is not expected to make a detailed or lengthy presentation.

#### **4. Master's Progress Reviews**

- Master's students must meet with their Thesis Committee at least every six months to review the progress. Typically, a student meets informally with the committee during the first spring semester, has a progress report meeting with the committee in the summer or fall semester, proposes in the fall/spring semester of the second year and defends the following spring/summer semester. The BME Program Administrator must be notified of all committee meetings.
- Starting with the second meeting, download the BME Graduate Student Committee Meeting Evaluation Form ([The BME Graduate Program Documents](#)) and pass it out to Committee members. At the conclusion of each meeting, ask a member of the Committee to collect the forms and turn them in to the BME Program Administrator. The BME Program Administrator will forward you the score averages and Committee comments.
- Starting with the second meeting, ask the Committee Chair to prepare a written report using the template available online ([The BME Graduate Program Documents](#)). The report should present the Committee consensus regarding progress made and goals met since the previous review, as well as specific goals set for the next review period. The Committee Chair report must be submitted to the BME Program Administrator no later than 2 weeks after the Committee meeting.
- Starting with the spring semester of the first year, and then every fall and spring semester, write your own progress report using the template available online ([The BME Graduate Program Documents](#)). Submit the progress report to the BME Program Administrator. Starting after the second Committee meeting, include a copy of the most recent Committee Chair report. The deadline for submission of the student's progress report is the last day of classes of the spring/fall semester.
- In the event that requirements for timely committee meetings and submission of progress reports are not met, such a student will be placed on probation and will have to fulfill these requirements within the next semester.

#### **5. Submission of Thesis Proposal and Admission to Candidacy**

After you have completed most of your course work, you must present your thesis research proposal. You should normally present the proposal during the third semester after you begin taking core courses. Under no circumstances should your plan be presented less than one semester before your thesis defense. By giving you and your committee time to review your planned work, you will avoid last minute surprises.

The thesis proposal should follow the format similar to the formats used for the preparation of an NIH RO1 or NSF research grant proposals. The thesis proposal should include a title page, an abstract, hypotheses and specific aims, a comprehensive literature survey, a significance section, data from preliminary studies, description of experimental design and methodologies, a discussion of potential problems anticipated and their solution, a timeline, and a list of references.

No later than two weeks prior to the proposal defense date, you must

- send the final draft of your written thesis proposal to the committee members
- provide the BME Program Administrator your proposal title and abstract, a list of committee members (indicating the committee chair), defense date, time and location so that the appropriate announcements can be distributed

Failure to provide the BME Department with the required information or your committee with the final draft of your proposal in a timely manner will result in cancellation of your scheduled defense so that the 2-week requirement can be met. Faculty members can be very busy, particularly near the end of a term. Therefore, you should start scheduling your defense meeting early, several weeks prior to the planned defense date. Also, be advised that it is often harder to schedule meetings in the summer.

Your advisor will give you details about what is expected of you during the thesis proposal presentation. Other students and faculty members are allowed to be present for the public portion of the proposal presentation.

You must download the BME M.S. Proposal Evaluation Form ([The BME Graduate Program Documents](#)) and pass it out to those in attendance at your proposal. After your proposal defense, a member of your committee will collect the forms and turn them in to the BME Graduate Program Administrator who will forward you the score averages and committee comments.

After your proposal defense

- fill out the Admission to Candidacy Form (<http://www.uab.edu/graduate/33-students/online-forms/218-application-for-admission-to-candidacy->) and have it signed by your thesis advisor. Note the additional Research Compliance Verification Form needed if your research involves humans or animals
- email to the BME Program Administrator at least 5 business days before the Graduate School deadline for submission of the Admission to Candidacy Form:
  - a PDF file with your final thesis proposal
  - the Admission to Candidacy Form
- After your proposal is approved, submit the signed Admission to Candidacy Form to the Graduate School by the deadline. After that, you are admitted to candidacy.

## **6. Presentation of Research Results at Scientific Meetings**

All Master's students are required to make at least one scientific presentation (oral or poster) at a local, national or international scientific meeting or at a seminar outside of the BME Department prior to graduation. Please let the BME Program Administrator know the details of your presentations in a timely manner.

## 7. Publication Requirement

It is the policy of the Department of Biomedical Engineering that each Plan I Master's student must have published or submitted for publication at least one original research article in an appropriate peer-reviewed journal before the thesis approval form is signed by the Program Director. This article/manuscript should be based primarily on the student's work and the student is expected to be the first author (or the prominent author). The Graduate Program Director will not sign the student's degree petition without evidence that a manuscript has been submitted.

## 8. Thesis Preparation

The thesis must be prepared and formatted according to the UAB Graduate School's instructions described in the UAB Format Manual for Theses and Dissertations ([The UAB Thesis and Dissertation website](#)). The thesis is expected to be of high-quality, excel technically and meet high standards for structure, grammar, and writing style. A typical thesis contains a title page, an abstract, introduction, objective, hypotheses, methods, results, discussion, future work conclusion and a complete bibliography.

The thesis is presumed to be the original research work of the student. If previously published material is used in the thesis, written permission to use the material must be obtained from the copyright holder (see the UAB Format Manual).

Students who have manuscript(s) published, accepted or submitted for publication can organize their thesis in the Preprint/Reprint style described in the UAB Format Manual ([The UAB Thesis and Dissertation website](#)). Please read the Manual regarding the copyright issues.

The thesis will be submitted to Turnitin for review of originality.

## 9. Defense of the Thesis

At the beginning of your final semester, you will need to complete an Application for Degree form ([The Graduate School Forms](#)) and turn it in to the Graduate School.

After you have completed your thesis research, you will present the results to your Master's Thesis Committee at a formal presentation open to public. You should attend a few of these events before your defense.

The date of the defense must comply with the Graduate School deadlines ([The Graduate School Deadline Dates](#)).

No later than two weeks prior to the thesis defense date, you must

- send your thesis to the committee members
- provide the BME Program Administrator your thesis title, a list of committee members (indicating the committee chair), abstract, the date, time and location of your defense so that the appropriate announcements can be distributed
- fill out the Request for Thesis Approval Form through the Graduate School (<http://www.uab.edu/graduate/request-thesis-or-dissertation-approval-forms-theses-and-dissertations>) and obtain the Thesis Approval Form

Failure to provide the BME Department with the details of your defense or your committee with the thesis in a timely fashion will result in cancellation of your scheduled defense so that the 2-

week requirement can be met. Faculty members can be very busy, particularly near the end of a term. Therefore, you should start scheduling your defense meeting early, several weeks prior to the planned defense date. Also, be advised that it is often harder to schedule meetings in the summer.

Committee members are encouraged to read the student's thesis within one week of receiving the manuscript. If there are significant problems with the document, the student, in consultation with their Research Advisor, may elect to re-schedule the defense.

After you make a formal presentation, the committee and the attending public can ask you questions. You are expected to be able to field these questions in a professional and efficient manner. The non-committee members are then asked to leave the room; your Graduate Thesis Committee will ask you additional questions and then decide whether or not you pass the final examination, the defense of your work.

As part of the overall assessment of the BME Master's Program, your committee members and others who attend your master's defense will complete the Master's Thesis Defense Evaluation Form. Download the form from [The BME Graduate Program Documents](#) and bring copies to your defense. After your defense, your Research Advisor will collect the forms and deliver them to the BME Program Administrator in Shelby 801-C. The BME Program Administrator will forward you the score averages and committee comments. The results of this evaluation are used by the BME Program to assess whether we are meeting Program Goals as required by the Southern Association of Colleges and Schools (SACS) to maintain program accreditation. The results of this evaluation are not used to determine whether the student passed the master's thesis defense.

All students must schedule their thesis final examination in accordance with the Graduate School policies (the UAB Graduate Student Handbook). Notably:

Under Plan I, the final examination should take the form of a presentation and public defense of the thesis, followed by an examination of the candidate's comprehensive knowledge of the field. The time, date, and location of this examination is reported to the Graduate School via the online Request for Thesis or Dissertation Approval forms (submitted at least 10 days before the public defense) and allows for the attendance of the Graduate School Dean. The meeting must be appropriately announced on campus, must be open to all interested parties, and must take place at least 30 days before the expected date of graduation. Plan I candidates must be registered for at least three semester hours of graduate work in the semester during which degree requirements are completed.

## **10. Thesis Defense Dissent**

From the UAB Graduate Student Handbook for a Master's Degree:

If in the opinion of more than one member of the thesis committee, the student has failed the thesis defense, there is no consensus to pass. The chair of the committee shall advise the student that the thesis fails to meet the requirements of the program. The chair shall notify the student in writing about the reason(s) for failure. If the student resubmits or submits a new thesis for consideration by his/her graduate program at least two members of the new examining committee shall be drawn from the original committee. If the modified or new thesis fails to meet the requirements of the program, the student shall be dismissed from the graduate program.

In the event that only one of the three committee members dissent, that individual must submit a letter in which he/she outlines the reasons for their dissent to the student's advisor. The advisor and student may then prepare a rebuttal statement that is submitted, along with the letter of dissent, to the advisory or executive committee of the program for review. The advisory committee can then decide to accept or reject the rebuttal statement. If the rebuttal is accepted, the student is passed on his/her thesis defense. If the rebuttal is rejected, the advisory committee can recommend to the student or advisor potential steps necessary to remediate the thesis and potentially also the work therein, or the committee can recommend that the student be dismissed from the program.

#### **11. Submission of the Thesis**

No later than one week (5 business days) following the public defense, send by e-mail the following papers to the BME Program Administrator for review and approval:

- the thesis in a PDF file
- the date of the public defense
- a full reference to a published or submitted peer-reviewed journal article on which the thesis is based
- a full reference to a presentation at a local, national or international scientific meeting or at a seminar outside of the BME Department prior to graduation
- a CV, including all publications and conference presentations

After the thesis is approved, submit the Thesis Approval Form signed by each committee member to the Graduate Program Director.

No later than two weeks (10 business days) following the public defense, the final version of the thesis must be submitted to the Graduate School online as a single PDF file. In addition, submit the Thesis Approval Form signed by each committee member and the Program Director, and the UAB Publication Agreement form (online). Follow the Graduate School requirements on thesis submission ([The UAB Thesis and Dissertation website](#)). Read and complete the Thesis/Dissertation Submission Checklist.

If your committee feels additional time is needed to complete the thesis, and if your defense was held well ahead of the semester deadline, the committee chair should email the Graduate School (Jan Baird at [jbaird@uab.edu](mailto:jbaird@uab.edu)) to request an extension. Extensions cannot be granted past the semester submission deadline (10 business days after the final defense deadline).

## 12. Petition for Admission into the Ph.D. Program

Following completion of Plan I Master's degree, students can apply to the Ph.D. Program. After thesis defense, a student needs to submit the following papers to the BME Program Administrator:

- an application letter addressed to the BME Graduate Program Committee
- a CV
- an endorsement letter signed by all members of student's Thesis Committee

The application will be evaluated by the BME Graduate Program Committee; it is not required to re-apply to the Graduate School. Admission to the Ph.D. Program requires publication of at least one peer-reviewed journal article (typically a first author publication). Admission to the Ph.D. program does not guarantee a specific research project or funding; the student should communicate with potential Ph.D. advisors to secure a project and funding around the time of the Master's defense.

## 13. Graduation

Plan to attend the graduation ceremony. This is a time-honored ceremony, and you have worked hard to earn this distinction for yourself. Take the time to enjoy one of the first fruits of your labor.

### 3.7.3 Milestone Summary for the M.S.B.M.E. Program

1. Enter with B.S. degree
2. Choose Research Advisor and research project (first semester). Submit Mentor Selection Form if Research Advisor is not a BME primary faculty member.
3. Formulate a preliminary Degree Plan with Research Advisor or Program Advisor and submit to the BME Graduate Program (first semester).
4. Complete a minimum of 24 semester hours of graduate level course work including: BME 517 Engineering Analysis or ME 661 Math Methods In Engineering (these courses are taught interchangeably depending on the year), BST 621 Statistical Methods I, BME 670 Quantitative Physiology, 12 additional hours of elective course work, and BME 601 (seminar, 3 hours).
5. Choose Master's Thesis Committee (second semester). Fill out Graduate Study Committee Letter and submit to the Graduate School.
6. Meet with the Thesis Committee to discuss research goals and progress (semi-annually, starting with the second semester). At each meeting, have committee members complete Graduate Student Committee Meeting Evaluation Form. After the meeting, ask the Committee Chair to submit the Chair report. Submit your own progress report before the last day of class of spring and fall semesters. Review and revise Degree Plan as necessary
7. Present the Thesis Proposal and be admitted to Candidacy (at least one semester before thesis defense, preferably in fourth semester after admission). Comply with Graduate School requirements on candidacy. Download BME M.S. Proposal Evaluation Form and pass it out to those in attendance at your proposal meeting. Complete the Admission to Candidacy form and turn it into the Graduate School by the deadline.
8. Complete 6 hours of thesis research (BME 699) in candidacy.

9. Make at least one scientific presentation (oral or poster) at a local, national or international scientific meeting, or a seminar outside BME prior to graduation.
10. Submit a first-author original research article based on thesis research into a peer-reviewed journal prior to submission of the Thesis Approval Form.
11. Schedule thesis defense. Complete an Application for Degree form and turn it in to the Graduate School before deadline (beginning of the final semester).
12. Two weeks before the defense: (i) present the Committee with copy of thesis; (ii) notify the BME Program Administrator; (iii) submit the online Request for Thesis Approval Form.
13. Present and defend the thesis in a well-publicized, public presentation before the Graduate School deadline. Bring Master's Thesis Defense Evaluation Form to your Thesis Defense.
14. Submit the thesis, CV, references to the thesis-related article and conference presentation to the BME Graduate Program Administrator for review no later than one week (5 business days) following the public defense. After the thesis approval, submit the Thesis Approval Form signed by each committee member to the Program Director for signature.
15. Submit the final version of the thesis approved by the Thesis Committee and the BME Program Director to the Graduate School for final review no later than two weeks (10 business days) following the public defense. Submit the Approval Form signed by committee members and the Program Director, and the UAB Publication Agreement form online.
16. Petition for admission into the Ph.D. program (if applicable).
17. Graduate.

### **3.8 The Program for the Doctor of Philosophy (Ph.D.)**

The Ph.D. degree is the highest degree awarded by academic institutions in the United States. By awarding the Ph.D. degree, a Doctoral Dissertation Committee certifies that an individual is capable of carrying out independent research. The Ph.D. program is designed to provide resources and mentoring of the student through the formulation and execution of a research question that has a size and importance to merit attention of the scientific and/or engineering discipline. Dissertation results must be published in refereed, reputable scientific or engineering journals. It is expected that dissertation work will result in peer-reviewed publications, written and submitted while a student is still in the Doctoral Program at UAB.

There are two paths to the Ph.D. Program, starting either with a B.S. or M.S.B.M.E. degree.

#### **3.8.1 Ph.D. Program after a B.S. Degree**

Students can be admitted to the Ph.D. Program with a B.S. degree in a field of biomedical engineering or closely-related discipline. Students with undergraduate degrees in the physical sciences, life sciences, or mathematics can also be considered for admission.

Students entering the Ph.D. program with a B.S. are required to complete at least 72 semester hours of graduate work including 48 semester hours of course work prior to candidacy and 24 hours of research over at least two semesters in candidacy.

The course work prior to candidacy (48 hours) includes:

- Core courses (9 credit hours):

- BME 517 Engineering Analysis or ME 661 Math Methods in Engineering.
- BST 621 Statistical Methods I.
- BME 770 Quantitative Physiology.
- Elective courses (33 credit hours): a combination of BME, engineering, math, or life sciences courses that provide sufficient breadth and depth to gain the necessary graduate-level, interdisciplinary knowledge to complete dissertation research. The elective course work should include
  - at least 6 hours of BME courses.
  - at least 6 hours of life science courses.
  - up to 6 hours of non-dissertation research (BME 798).
- BME seminars BME 701 (6 hours).

The course work in candidacy includes 24 hours of dissertation research (BME 799) taken over at least two semesters in candidacy. Out of these 24 hours, 12 hours can be substituted by non-dissertation research (BME 798) taken before candidacy.

It is emphasized that 72 hours is a minimum requirement and most students complete many more hours than this minimum while earning the Ph.D. degree.

At least three first-author original research articles in peer-reviewed journal based on student's research are required for completion of the Ph.D. in the Department of Biomedical Engineering.

The time limit for completion of Ph.D. degree starting with a B.S. is 5 years. Continuation beyond this time limit requires a petition to the BME Graduate Program Committee (see 3.6)

### **3.8.2 Ph.D. Program after a M.S.B.M.E. Degree**

Students can be admitted to the Ph.D. Program following completion of M.S. Degree in BME or equivalent professional degree.

Students entering the Ph.D. program with a M.S.B.M.E. degree are required to complete at least 48 semester hours of graduate work beyond the Master's degree, including 24 hours of course work prior to candidacy and 24 hours of research over at least two semesters in candidacy. The course work prior to candidacy includes:

- Core courses if not taken as part of their Master's program (9 credit hours):
  - BME 517 Engineering Analysis or ME 661 Math Methods in Engineering.
  - BST 621 Statistical Methods I.
  - BME 770 Quantitative Physiology.
- Elective courses (12 credit hours): a combination of BME, engineering, math, or life sciences courses that provide sufficient breadth and depth to gain the necessary graduate-level, interdisciplinary knowledge to complete dissertation research. The elective course work should include
  - at least 3 hours of BME courses.
  - at least 3 hours of life science courses.
  - up to 3 hours of non-dissertation research (BME 798).
- BME seminars BME 701 (3 hours)

The course work in candidacy includes 24 hours of dissertation research (BME 799) taken over at least two semesters in candidacy. Out of these 24 hours, 12 hours can be substituted by non-dissertation research (BME 798) taken before candidacy.

It is emphasized that 48 hours is a minimum requirement and most students complete more hours than this minimum while earning the Ph.D. degree. Students in the Dental Scientist and M.D./Ph.D. programs can enter the Ph.D. program without a M.S. degree and work directly toward the Ph.D.

Note that all Ph.D. students in BME must complete a total of 48 semester hours of approved graduate course work prior to candidacy. Thus, if during M.S.B.M.E. studies you complete more than 24 semester hours of graduate course work in life sciences, biomedical engineering, mathematics and statistics, the coursework requirements for the Ph.D. may be less than 24 semester hours.

A total of three first-author original research articles in peer-reviewed journals based on student's research, are required for completion of the Ph.D. in the Department of Biomedical Engineering. If one article was published as part of the M.S.B.M.E. degree, then two additional articles are required for the Ph.D. degree.

The time limit for completion of Ph.D. degree starting with M.S.B.M.E. is 4 years. Continuation beyond this time limit requires a petition to the BME Graduate Program Committee (see 3.6)

### **3.8.3 General Requirements for Ph.D. Students**

1. At least one year of residency (two semesters on campus as a full-time student) is required by the Graduate School for all Ph.D. students. It is extremely difficult to obtain the Ph.D. degree unless the program is pursued on a full-time basis; consequently, part-time Ph.D. programs are strongly discouraged in BME. Thus, only full-time students will be admitted for Ph.D. studies. Students who obtain employment after entering the Ph.D. program must receive permission from their Graduate Dissertation Committee and the BME Graduate Committee to continue in the Ph.D. program. Students must show continued progress to remain in the Ph.D. program.
2. All students who are accepted into the Ph.D. program should remember to register for 700 level courses and/or research hours each semester.
3. Note that you are required to submit certain paperwork to the Graduate School at several points in your program. It is very important that you notify the BME Program Administrator well in advance of your meetings to present dissertation proposals or defenses. The BME Program Administrator must also be notified regarding the selection of your Graduate Dissertation Committee members, or any time you change any member of your committee.
4. The Graduate School requires that a student must be admitted to candidacy before they can register for BME 799. This means you cannot register for these courses and accrue the required number of dissertation hours until you have completed the Comprehensive Exam and been admitted to candidacy.
5. The Graduate School requires that admission to candidacy take place at least two semesters before graduation. Be admitted to candidacy well in advance of your planned graduation date!
6. Your Graduate Dissertation Committee is a group of experts in your field who are committed to helping you develop your abilities as an independent investigator. You should develop a

good working relationship with your committee. Regular communication with your committee members (both formally and informally) is strongly encouraged. You must meet with your committee as a group at least once a year. These meetings may be in the form of a formal update, proposal, or defense. The purpose of these meetings is to ensure satisfactory progress toward your degree via timely communication among the student and members of the committee. You must notify the BME Program Administrator of these meetings.

Please see the UAB Graduate Student Handbook for more information.

### **3.8.4 Ph.D. Milestones**

The following are required milestones in the Ph.D. program.

#### **1. Selecting Research Advisor**

Each student has to identify a Research Advisor by the end of the first semester of graduate program. If this requirement is not fulfilled, the student might be dismissed from the Graduate Program. It is a student's responsibility to choose a Research Advisor. This person must agree to accept you as a student.

If the Research Advisor holds a primary appointment in BME, this person will also serve as the Program Advisor. If the Research Advisor is not a primary BME faculty member, then

- complete an Advisor Selection Form ([The BME Graduate Program Documents](#)) and submit it to the BME Program Administrator.
- select a Program Advisor from faculty with a primary appointment in BME. The Program Advisor will serve on the dissertation committee and will ensure that the student meets requirements for the Ph.D. degree.

#### **2. Formulating Degree Plan**

The preliminary Degree Plan must be formulated with help of the Research Advisor (and Program Advisor, if applicable) by the end of the first semester of Ph.D. program. Degree Plan forms as well as Degree Plan Guidelines can be downloaded from [The BME Graduate Program Documents](#). The plan must be sent to the BME Program Administrator.

The Degree Plan lists all core and elective courses the student is expected to take for the degree. You should keep a copy of the Degree Plan and use it as a guide for registering for courses. Changes in the Degree Plan will be made in conjunction with the student's Research Advisor and Program Advisor, or in some cases with the student's Graduate Dissertation Committee. Changes to the Degree Plan must be sent to the BME Program Administrator.

#### **3. Selecting Graduate Dissertation Committee**

Graduate Dissertation Committee must be selected by the end of the second semester in the BME Program. Fill out a Graduate Study Committee Letter ([The Graduate School Forms](#)), submit it for approval to the BME Graduate Program Administrator. After that, submit the Letter to the UAB Graduate School. If there is ever a change in your Dissertation Committee, a Change of Graduate Study Committee form must be filled out and turned in to the Graduate School. Graduate Study Committee appointments are made by the Graduate School Dean, who is an ex officio member of all graduate study committees.

You should have a minimum of five persons on the Dissertation Committee, including the Research Advisor. At least one Dissertation Committee member must hold a primary appointment in the BME Department. Two committee members must have appointments outside the BME Department. An external reviewer or Dissertation Committee member outside UAB is strongly recommended.

Any committee member, who is not already appointed to the UAB graduate faculty, has to be appointed as an ad hoc committee member. The procedure for requesting *ad hoc* appointment can be found at <http://www.uab.edu/graduate/gradfaclist>. The request should be sent to the Dean of the Graduate School as a single PDF file containing (i) a letter of nomination from the student's advisor, (ii) a completed Recommendation for Appointment to Graduate Faculty form, and (iii) the applicant's current CV. A copy of the file should be also sent to the BME Program Administrator.

Faculty members are not required to serve on a student's committee so it is up to a student to contact potential committee members to discuss the proposed research. Most faculty members will agree to serve on a committee if they are not already over committed. Each committee member should be able to bring some relevant expertise to guide your research.

An initial meeting with the Graduate Dissertation Committee must be held before the end of the second semester in the Ph.D. Program. The first committee can be fairly informal with the purpose for the student to get to know the committee members, and for the committee members to learn about the area of study for the dissertation, about the project outline and broad goals. The student is not expected to make a detailed or lengthy presentation.

#### **4. Ph.D. Progress Reviews**

- Following the initial committee meeting, Ph.D. students must meet with their Dissertation Committee at least once a year, typically by the end of the spring semester. These meetings may be in the form of a formal update, proposal, or defense. The purpose of these meetings is to ensure satisfactory progress toward student's degree via timely communication among the student and members of the Committee. The BME Program Administrator must be notified of all committee meetings.
- Starting with the second meeting, download the BME Graduate Student Committee Meeting Evaluation Form ([The BME Graduate Program Documents](#)) and pass it out to Committee members. At the conclusion of each meeting, ask a member of the Committee to collect the forms and turn them in to the BME Program Administrator. The BME Program Administrator will forward you the score averages and Committee comments.
- Starting with the second meeting, ask the Committee Chair to prepare a written report using the template available online ([The BME Graduate Program Documents](#)). The report should present the Committee consensus regarding progress made and goals met since the previous review, as well as specific goals set for the next review period. The report should be submitted to the BME Program Administrator no later than 2 weeks after the meeting.
- At the end of each spring semester (including the first year), write your own progress report using the template available online ([The BME Graduate Program Documents](#)). Submit the progress report to the BME Program Administrator. Starting with the second year, include a copy of the most recent Committee Chair report. The deadline for submission of the student's progress report is the last day of classes of the spring semester.

- In the event that requirements for timely committee meetings and submission of progress reports are not met, such a student will be placed on probation and will have to fulfill these requirements within the next semester.

## 5. Planning the Dissertation Research

An important part of your training will be to learn by experience how to carry out research. Several of the faculty members have documentation on this subject. You will find that each faculty member has a slightly different style in advising students and approaching research problems. You should use this opportunity to observe these different processes, learn as much as you can about the different approaches, and most importantly, to find out which approaches are the most productive for you in carrying out independent research.

## 6. Comprehensive Examination and Admission to Candidacy

The Comprehensive Examination is a very important step forward in the student's pursuit of the doctorate. By this step, the graduate committee indicates its confidence that the student is capable of completing the proposed research project and the doctoral program. After passing this exam you can be admitted to candidacy.

The Graduate School requires you to be admitted to candidacy at least two semesters before you plan to graduate. For students entering the BME program and who are also admitted to the Dental Scientist program, they should take the Comprehensive Exam in the second year of their program. M.D./Ph.D. students normally enter the Ph.D. phase of their studies in year three. These students should take the Comprehensive Exam by the end of year three. The deadline date for the Comprehensive Exam is the last day of classes for the semester BEFORE candidacy.

The Comprehensive Exam consists of the submission of a written research proposal and an oral defense of the proposal.

The written dissertation proposal should follow the format similar to the formats used for the preparation of an NIH RO1 or NSF research grant proposals. The dissertation proposal should include a title page, abstract, hypotheses and specific aims (or goals and objectives), a comprehensive literature survey, a significance section, data from preliminary studies, description of experimental design and methodologies, a discussion of potential problems anticipated and their solution, a timeline, and a list of references.

No later than two weeks prior to the oral defense date, you must

- send the final draft of your written dissertation proposal to the committee members
- provide the BME Program Administrator your proposal title and abstract, a list of committee members (indicating the committee chair), defense date, time and location so that the appropriate announcements can be distributed

Failure to provide the BME Department with the required information or your committee with the final draft of your proposal in a timely manner will result in cancellation of your scheduled defense so that the 2-week requirement can be met. Faculty members can be very busy, particularly near the end of a term. Therefore, you should start scheduling your defense meeting early, several weeks prior to the planned defense date. Also, be advised that it is often harder to schedule meetings in the summer.

Since the committee meeting for the Comprehensive Examination is so important, it should be scheduled through the Graduate School to allow the dean to attend.

During the oral examination, the committee will examine the proposal and the student's background for conducting the proposed studies. The oral defense of the proposal is open to the public.

You must download the BME Ph.D. Proposal Evaluation Form ([The BME Graduate Program Documents](#)) and pass it out to those in attendance. After your proposal presentation, a member of your committee will collect the forms and turn them in to the BME Graduate Program Administrator who will forward you the score averages and committee comments.

After the student has completed the oral phase of the examination, the committee will meet in a closed session, ask the student additional questions and then decide the outcome of the comprehensive examination. Three outcomes are possible: 1) unconditional pass; 2) conditional pass (meaning the student must meet other conditions agreed upon by the committee such as passing specified courses, rewriting portions of the proposal, re-defending the proposal, or re-examination on selected areas); or 3) fail.

After passing the Comprehensive Examination:

- fill out the Admission to Candidacy Form (<http://www.uab.edu/graduate/33-students/online-forms/218-application-for-admission-to-candidacy->) and have it signed by members of the Dissertation Committee (type their names on the form as well). Note the additional Research Compliance Verification Form needed if your research involves humans or animals
- email to the BME Program Administrator at least 5 business days before the Graduate School deadline for submission of the Admission to Candidacy Form:
  - a PDF file with your final dissertation proposal
  - the Admission to Candidacy Form
- After your proposal is approved, submit the signed Admission to Candidacy Form to the Graduate School by the deadline. After that, you are admitted to candidacy.

## **7. Publication Requirements**

It is the policy of the BME Department that the student is expected to write and publish/submit at least three original research articles based on the dissertation research in peer-reviewed journals (two articles if the student continued into Ph.D. after M.S.B.M.E. with one published article). These manuscripts should be based primarily on the student's work. It is expected that the student is the first author on the required articles. The BME Graduate Program Director will not sign the student's degree approval form without evidence that the articles were published or submitted.

## **8. Seminar Presentation Requirement**

All Ph.D. students are required to present their research progress in a BME Department Seminar. This seminar will typically occur within one or two semesters before graduation. You must contact a BME seminar coordinator to schedule your seminar presentation at the beginning of a semester prior to the semester in which you want to make your presentation to ensure that the seminar schedule is not filled.

The BME seminar is attended by faculty, students (graduate and undergraduate), clinicians, practicing professionals and others from the UAB community. As part of the overall assessment

of the BME Doctoral Program required by the Southern Association of Colleges and Schools (SACS) to maintain program accreditation, your committee members and others who attend your seminar presentation will complete the Ph.D. Seminar Evaluation Form ([The BME Graduate Program Documents](#)) and bring copies to your seminar presentation. After the presentation, your Research Advisor or another faculty member will collect the forms and deliver them to the BME Program Administrator in Shelby 801-C. The BME Program Administrator will forward you the score averages and committee comments. The results of this evaluation are used by the BME Program to assess whether we are meeting Program Goals as required by SACS.

## **9. Dissertation Preparation**

The dissertation must be prepared and formatted according to the UAB Graduate School's instructions described in the UAB Format Manual for Theses and Dissertations ([The UAB Thesis and Dissertation website](#)). The dissertation is expected to be of high-quality, excel technically and meet high standards for structure, grammar, and writing style.

The dissertation is presumed to be the original work of the student. If previously published material is used in the dissertation, written permission to use the material must be obtained from the copyright holder (see the UAB Format Manual).

Students who have manuscripts published, accepted or submitted for publication can organize their dissertation in the Preprint/Reprint style described in the UAB Format Manual. Please read the Manual regarding the copyright issues.

The dissertation will be submitted to Turnitin for review of originality.

## **10. Defense of the Dissertation**

At the beginning of your final semester, you will need to complete an Application for Degree form ([The Graduate School Forms](#)) and turn it in to the Graduate School.

After you have completed your dissertation research, you will present the results to your Dissertation Committee at a formal presentation open to public. You should attend a few of these events before your time comes.

The date of the defense must comply with the Graduate School deadlines ([The Graduate School Deadline Dates](#)).

No later than two weeks prior to the defense date, you must

- send your dissertation to the committee members.
- provide the BME Program Administrator with dissertation title and abstract, a list of committee members (indicating the committee chair), the date, time and location of your defense so that the appropriate announcements can be distributed.
- fill out the Request for Dissertation Approval Form through the Graduate School (<http://www.uab.edu/graduate/request-thesis-or-dissertation-approval-forms-theses-and-dissertations>) and obtain the Dissertation Approval Form.

Failure to provide the BME Department with the details of your defense or your committee with the final draft of your dissertation at least two weeks in advance of your defense will result in cancellation of your scheduled defense so that the 2-week requirement can be met. Faculty members can be very busy, particularly near the end of a term. Therefore, you should start

scheduling your defense meeting early, several weeks prior to the planned defense date. Also, be advised that it is often harder to schedule meetings in the summer.

Committee members are encouraged to read the student's dissertation within one week. If there are significant problems with the document, the student, in consultation with their Research Advisor, may elect to re-schedule the defense.

After you make a formal presentation, the committee and the attending public will ask you questions. You are expected to be able to field these questions in a knowledgeable, professional and efficient manner. The non-committee members are then asked to leave the room, and your Graduate Thesis Committee will ask you additional questions and then decide whether or not you pass the final examination, the defense of your work.

The dissertation defense must be open to all interested parties and should be widely publicized on the UAB campus. Candidates must be registered for at least three semester hours of graduate work during the term in which the dissertation defense takes place.

As part of the overall assessment of the BME Doctoral Program, your committee members and others who attend your doctoral defense will complete the Doctoral Dissertation Defense Evaluation Form. You must download the form from the BME website ([The BME Graduate Program Documents](#)) and bring copies to your defense. After your defense, your Research Advisor will collect the forms and deliver them to the BME Program Administrator in Shelby 801-C. The BME Program Administrator will forward you the score averages and committee comments. The results of this evaluation are used by the BME Program to assess whether we are meeting Program Goals as required by the Southern Association of Colleges and Schools (SACS) to maintain program accreditation. The results of this evaluation are not used to determine whether the student passed the Doctoral Dissertation defense.

In the event that only one of the five committee members dissent, that individual must submit a letter in which he/she outlines the reasons for their dissent to the student's advisor. The advisor and student may then prepare a rebuttal statement that is submitted, along with the letter of dissent, to the advisory or executive committee of the program for review. The advisory committee can then decide to accept or reject the rebuttal statement. If the rebuttal is accepted, the student is passed on his/her dissertation defense. If the rebuttal is rejected, the advisory committee can recommend to the student or advisor potential steps necessary to remediate the dissertation and potentially also the work therein, or the committee can recommend that the student be dismissed from the program.

## **11. Submission of the Dissertation**

No later than one week (5 business days) following the public defense, the following papers must be sent by e-mail to the BME Program Administrator for review and approval:

- the dissertation in a PDF file
- the date of the public defense
- a list of 3 published or submitted peer-reviewed journal articles on which the dissertation is based
- a reference to the BME seminar where dissertation research was presented
- a CV, including all publications and conference presentations

After the dissertation is reviewed and approved, submit the Dissertation Approval Form signed by each committee member to the Graduate Program Director.

No later than two weeks (10 business days) following the public defense, the final version of the dissertation must be submitted online (as a single PDF) to the Graduate School. Also submit the Dissertation Approval Form signed by each committee member and the Program Director, the UAB Publication Agreement, Survey of Earned Doctorates, and the Graduate School Exit Survey. Follow the Graduate School requirements on dissertation submission ([The UAB Thesis and Dissertation website](#)). Read and complete the Thesis/Dissertation Submission Checklist.

If your committee feels additional time is needed to complete the dissertation, and if your defense was held well ahead of the semester deadline, the committee chair should email the Graduate School (Jan Baird at [jbaird@uab.edu](mailto:jbaird@uab.edu)) to request an extension. Extensions cannot be granted past the semester submission deadline (10 business days after the final defense deadline).

## **12. Graduation and Award of the Ph.D.**

Attend the graduation ceremony and experience the hooding ceremony for the Ph.D. candidate. You will be "hooded" by your Research Advisor. This is a time-honored ceremony, and you have worked hard to earn this distinction for yourself. Take the time to enjoy one of the first fruits of your labor.

### **3.8.5 Milestone Summary for Ph.D. Program**

1. Enter with B.S. or M.S. degree.
2. Choose Research Advisor and Program Advisor (first semester). Fill out Mentor Selection Form if Research Advisor is not a BME primary faculty member.
3. Formulate preliminary Degree Plan with your Research and Program Advisors and submit to the BME Graduate Program (first semester).
4. Complete minimum of 48 semester hours (if entering with B.S.) or 24 hours (if entering with M.S.) of graduate course work prior to candidacy. The course work includes at least one semester of BST 621/622 Biostatistics (two courses are strongly recommended), BME 517 Engineering Analysis, BME 670/770 Quantitative Physiology, BME 701 (seminar, 6 hours after B.S., 3 hours after M.S.), and elective courses
5. Choose Dissertation Committee (second semester). Fill out Graduate Study Committee Letter and submit to the Graduate School
6. Meet with Dissertation Committee (at least once a year) to discuss your research progress and to revise your Degree Plan as needed. At each meeting, have committee members complete Graduate Student Committee Meeting Evaluation Form. Ask the Committee Chair to submit the Chair report no later than 2 weeks after the meeting. Submit your own progress report before the last day of classes of spring semester.
7. Complete Comprehensive Exam and be admitted to Candidacy at least two semesters before your planned graduation. Submit written proposal to Dissertation Committee two weeks prior to oral defense. Follow the Graduate School deadline for the Comprehensive Exam.
8. Complete 24 hours of dissertation research (BME 799/798) over at least two semesters in candidacy.
9. Present research progress in BME Department Seminar. Schedule your seminar presentation at the beginning of the preceding semester. Bring copies of the Ph.D. Seminar Evaluation Form to the BME Program office.

10. Publish or submit at least three (after B.S.) or two (after M.S.B.M.E. with published paper) first-author original research articles in peer-reviewed journals.
11. Schedule dissertation defense. Comply with the Graduate School deadline for that semester.
12. Two weeks before the defense: (i) present the Committee with copy of dissertation; (ii) notify the BME Program Administrator; (iii) submit the online Request for Dissertation Approval Form.
13. Present and defend dissertation in a well-publicized, public Final Examination before the Graduate School deadline. Bring copies of the Doctoral Dissertation Defense Evaluation Form to the defense.
14. Submit the committee-approved dissertation, CV, references to the thesis-related articles and BME seminar presentation to the BME Graduate Program Administrator for review no later than one week (5 business days) following the public defense. After the dissertation approval, submit the Dissertation Approval Form signed by each committee member to the Program Director for signature.
15. Submit the completed, final version of the dissertation approved by the committee and the BME Program Director to the Graduate School no later than two weeks (10 business days) following the public defense. Also submit online the UAB Publication Agreement, Survey of Earned Doctorates, and the Graduate School Exit Survey.
16. Graduate.

## **4 Additional Policies and Guidelines**

### **4.1 Guidelines on Dissertation and Thesis Research**

Students frequently ask what constitutes a dissertation or a thesis. There is no direct answer to this question; however the following suggestions might be used as a guideline.

Ph.D. dissertation:

- provides a substantial increment of knowledge or basic understanding
- has publishable results in reputable, refereed journals
- provides a significant and novel device, instrument, analysis, or process in biomedicine
- contains significant engineering content that brings a unique approach to the solution of the problem that is not available from other disciplines
- contains a suitable increment of originality and uniqueness
- independent, free-thinking approach by student
- NOTE: Quantity of work does not substitute for the above requirements!

M.S. thesis:

- has components of the above, but can be more closely directed by the faculty member.

### **4.2 Reprint/preprint Format of Dissertation and Thesis**

A dissertation may consist of a number of accepted or published papers that are bound together with an introductory and conclusion chapters to form the thesis or dissertation document. The journals selected for manuscript submission must include some biomedical engineering or engineering journals, they should be respected in the field of research, and they should be truly

peer-reviewed by the blind referee process. The Dissertation Committee reserves the right to require additional documentation in the dissertation or thesis document in excess of the material presented in the papers. The Dissertation Committee also has the responsibility of judging the quality and suitability of the journals chosen for manuscript submission.

The Committee will use particular care in reviewing material in manuscripts that have not been accepted for publication, but are included as part of the dissertation. Finally, the format of the dissertation must meet the requirements of the Graduate School ([The UAB Thesis and Dissertation website](#)).

For the reprint/preprint format for the M.S. thesis, all of the above applies, except at least one manuscript is required to have been submitted at the time of thesis defense.

### **4.3 Thesis and Dissertation Development, Edit and Review Policy**

All students are expected to submit a high-quality thesis or dissertation available to the public that excels technically and meets high standards for structure, grammar, and writing style that conform to the UAB Graduate School requirements ([The UAB Thesis and Dissertation website](#)). In the event that the thesis or dissertation does not meet the quality standards established by the BME Department and Graduate School, the mentor or Graduate Program Director may require review by an external editor. The expense for editing is the responsibility of the student, although the mentor may support it from research funds at her or his discretion. The following policies were formulated by the School of Engineering Graduate Program Directors and Department Chairs to ensure that each thesis or dissertation submitted meets Graduate School and School of Engineering requirements for technical excellence and readability.

1. The student works under the direction of the Research Advisor to develop the thesis. When the Research Advisor is satisfied with the content, the thesis is given a 'heavy' edit by an outside reader.
2. The student brings the 'edited' copy of the thesis to the Research Advisor and obtains the Advisors approval to distribute the thesis to the Thesis or Dissertation Committee.
3. The Committee members review the thesis or dissertation and provide feedback to the student on technical content, style, and readability (grammar, etc.).
4. After the defense the student works under the direction of the Research Advisor to revise the thesis or dissertation as necessary. The Committee members do not sign to approve the thesis or dissertation until they have reviewed it and are satisfied that all needed corrections have been made.
5. The student forwards the revised thesis or dissertation to the Graduate Program Administrator. The Graduate Program Director reviews the final version of the Dissertation to ensure that it excels technically and meets high standards for structure, grammar, and writing style. The Graduate Program Director either signs to approve or meets with the student to discuss any needed corrections.

### **4.4 Laboratory Safety**

The School of Engineering and Department of Biomedical Engineering are strongly committed to laboratory safety. All incoming graduate students are required to complete safety training prior to beginning work in their respective laboratory. Students must read the BME Safety Manual and submit a completed copy to the BME Safety Officer, Dr. Joel Berry

([jlberry@uab.edu](mailto:jlberry@uab.edu)) prior to being allowed to use laboratory facilities. General safety information is also available at the UAB Occupational Health and Safety (OHS) website (<http://www.uab.edu/ohs/>).

The following rules apply to all BME Laboratory spaces:

- All graduate students must attend the School of Engineering Safety Seminar every year. The seminar is held in the fall semester. You will be notified about the time and location of the seminar via e-mail well in advance of the seminar.
- Safety glasses are to be worn at all times unless other eye protection is in use (such as a hood sash, face shield, glove box, etc.).
- Additional personal protective equipment (gloves, lab coats, face shields, etc.) should be used as appropriate for the task being performed.
- Shorts or short skirts are prohibited, garments should reach below the knee. Loose clothing is not recommended particularly in areas with moving equipment.
- No food or drink is allowed in any lab. No eating, drinking, chewing gum or applying makeup.
- Footwear must be of sturdy construction. It must completely enclose the toes.
- Do not run, jump, throw objects or otherwise engage in inappropriate behavior.
- Desk areas within a lab space are considered part of the lab for all rules unless separated from the lab by a partition.
- Lab doors should be closed at all times.

Most students will be required to take additional training depending on their area of research and the type of research performed by others in the same lab space. Use of chemicals, animals, radioactive agents, biologics, human blood or organs and human subjects all require additional training available on the OHS website.

#### **4.5 Animal Subjects and Human Subjects**

If the graduate research involves use of animal subjects, approval from IACUC (Institutional Animal Care and Use Committee) must be obtained before admission to candidacy and must be kept current until the research is completed. For more information regarding IACUC requirements, visit <https://www.uab.edu/graduate/22-students/orientation/225-institutional-animal-care-and-use-committee-iacuc>.

If your thesis or dissertation project involves human subjects, contact the office of the Institutional Review Board for Human Use early in the project to ensure compliance (<https://www.uab.edu/graduate/22-students/orientation/224-institutional-review-board-for-human-use-irb>). Approval from IRB must be obtained before admission to candidacy and must be kept current until the research is completed. The student's name must appear on all IRB Approval Forms.

#### **4.6 Purchasing, Pay and Other Financial Considerations**

##### **Purchases**

The University has very specific procedures for purchasing and procurement, and is required to meet numerous state and federal standards. For that reason, there are procedures in place for obtaining bids from vendors, entering into contracts, tracking equipment, surplus warehousing, transfer, and disposal of equipment, etc.

In most instances you will use a purchase order to an approved vendor, or a check request issued in advance of the purchase, to secure supplies, equipment, etc. There are procedures in place for reimbursement of expenses when there is a need for the immediate purchase of items using personal funds. Non-employees, however, are not allowed to make purchases using personal funds and will not be reimbursed! You will best obtain needed items with a purchase order, so plan ahead. The process requires appropriate account information and approvals and takes time. Do not wait until the last minute to place orders! There are also specific requirements for travel for the purpose of training and development. Again, the process must be approved in advance, budgeted and takes time, so plan ahead. You can get information about making purchases from your Program Advisor or Research Advisor, and from BME administrative staff.

### **Pay Guidelines**

Students in the BME Graduate Program are funded in a number of ways and from a number of sources. You should schedule a meeting with the BME Program Administrator to complete the required paperwork to be set up for pay and direct deposit. The process for international students requires additional steps, and should be started as soon as you arrive in the Birmingham area. Not allowing enough time to process the paperwork may result in your pay being delayed by a month or more.

As a Trainee receiving a stipend or an Assistant receiving a salary, you will need to complete the appropriate tax forms in ORACLE Self-Service. If you need help, you should seek assistance from your tax professional. International students receiving a salary should schedule an appointment with Daizy Walia in International Scholars and Student Services (ISSS) for assistance with required tax forms.

Additionally, UAB Payroll Services can assist you (934-4523; [payhelp2@uab.edu](mailto:payhelp2@uab.edu); <http://financialaffairs.uab.edu/content.asp?id=144343>).

Any student who does not complete the required forms will be taxed at the highest rate.

### **Tuition payment**

Students who receive a tuition scholarship will have their tuition and fees paid by the BME Program Administrator. If any changes are made in your schedule after you have received notification that your tuition has been paid, you should contact the Administrator to make sure there are no changes in your total tuition bill. Late payment of tuition and fees may result in your being dropped from classes and/or charged late fees. The University does not waive late fees, and BME will not be responsible for late fees if you do not notify the BME staff of any changes in a timely manner.

## **4.7 Miscellaneous Policies**

### **Registering for courses**

Students must complete the courses in the Degree Plan in a timely manner. To register for courses, you will receive a Registration Access Code (RAC) number from the BME Program Administrator. The RAC number is sent to the student via e-mail. Please keep this RAC number until the semester is finished. The student should follow the procedures for registration, and register for each term during the dates specified in the UAB Class Schedule.

Students can register their research hours online. If you don't see the advisor listed for research hours, contact the BME Program Administrator to add the advisor information to the system.

### **Computer facilities and computer use policies**

Information about computer use at UAB can be found by visiting the Information Technology web page at <http://www.uab.edu/it/policies>. This site contains numerous policies addressing security, use of cellular phones, software, Internet use, disclosure and confidentiality. Students should pay particular attention to the Acceptable Use Policy.

### **Keys, Blazer ID, key card access to buildings and labs. Key return policy.**

Your **CampusCard** is a valuable accessory at UAB, so carry it at all times. It guarantees free or reduced admission charges to special events, allows you to check out books from the UAB libraries, and is required for access to the Campus Recreation Center. You will be given instructions during orientation to set your CampusCard, keys, and key card access to buildings and labs.

Keys and key cards are issued to a particular person, so it is important for you to be responsible for any issued to you. The key card access system monitors and records all card transactions presented to the card readers on the UAB complex. Keys and key cards must be returned when you no longer need that particular key or key card access, or when you leave the university. Duplication is not allowed. If lost, you will be charged for replacement of lost keys and key cards. For additional information, see (<http://www.uab.edu/businessservices/physical-security>). For questions please see the BME Program Administrator.

**Oracle Self-Service** is a website that allows you to update your Personal Information, Direct Deposit Information, tax forms, home address, etc. You may find more information on Oracle at <http://www.uab.edu/adminsys/>.

A **BlazerID** is a computer login name that is used across campus. For procedures for getting a BlazerID go to <http://www.uab.edu/blazerid>.

**Parking information** for students is found at <http://www.uab.edu/parking/parking/students>. Parking is assigned on a first-come, first-serve basis. After-hours parking is available for certain areas. After-hours is defined as 5 p.m. - 6 a.m. weekdays, and all day weekends. This access is free for any graduate student with a deck permit. For those in commuter or resident student facilities, a \$30 per semester charge applies. Current after-hours locations are:

- University Boulevard Deck
- 5th Avenue Deck
- Lot 16A (Underneath Education Building)

Graduate students also have access to the UAB Escort Service (5 p.m. – dawn) and Campus Ride (<http://www.uab.edu/parking/campus-ride-a-escort>)

### **Appeals and Grievances**

The Graduate School Appeals Board policy is in the UAB Graduate Student Handbook.

## Appendices

### Appendix A: Courses Acceptable for BME Degree Plans

The Degree Plan lists the course work a student intends to take to fulfill the degree requirements. Courses must provide advanced training in interdisciplinary skills necessary to address multidisciplinary biomedical engineering research topics. Courses should complement and augment skills developed in thesis research. All degree plans include core course in Engineering Mathematics, Biostatistics and Quantitative Physiology, as well as elective courses from Biomedical Engineering, Engineering, Physics and Life Sciences. The elective courses should extend and integrate the fundamental knowledge to address interdisciplinary biomedical engineering problems. The core courses and the number of credit hours required for completion of each degree are provided in respective sections above.

A list of pre-approved elective life sciences and physics courses can be found at [The BME Graduate Program Documents](#). If desired courses are not on this list, a brief memorandum describing the rationale for the selected courses signed by the research advisor must accompany the Degree Plan. The student should indicate how the selected courses support the student's research and academic goals. The Graduate Program Committee will evaluate the proposed course work with regard to depth, breadth, relevance to research objectives, and academic rigor.

The course work for the M.S. and Ph.D. degree must be at the graduate level (e.g. 500 level or above). UAB does not allow courses below the 500 level for either M.S. or Ph.D. degrees. Except in unusual circumstances, Independent Study or Special Topics courses cannot be used to fulfill coursework requirements. All courses appearing on the Degree Plan must be taken for a letter grade. Journal Clubs cannot be used as course substitutions.

A grade of 'C' or better must be earned in each course. Students must maintain an overall GPA of 3.2 to remain in good academic standing in the Biomedical Engineering Department.

In accordance with UBA policy on transfer of credit, previously earned graduate credit that has not been applied toward another degree (either at UAB or elsewhere) is eligible for transfer into the student's current degree program. Read the UAB Graduate Student Handbook for details on this policy.

Under some circumstances, courses taken for a completed M.S. degree (at UAB or another institution) may be approved by the Graduate Program Committee for the Ph.D. Degree Plan. These courses must be at the graduate level and substantially similar in breadth, depth and rigor to courses offered at UAB. The student must have earned a grade of 'B' or higher in each course. The student should submit a course syllabus or detailed course description and an academic transcript for each graduate-level transfer course appearing on the Ph.D. Degree Plan.

## **Appendix B: UAB Graduate School Fellowship Incentive Program and Sources of Graduate Student Fellowships**

**Rationale and Goal:** Relative to similar institutions which have vigorous research programs and generous external funding, UAB has a number of graduate students who have applied for and secured an individual fellowship to support their pre-doctoral education. We believe that many of our graduate students would be competitive for individual awards. Accordingly, the Graduate School has established an incentive plan designed to encourage more students to apply for individual fellowships.

### **Plan Description:**

1. The Graduate School will provide a monetary incentive for students to APPLY FOR individual fellowships funded by extramural agencies or foundations. Graduate students who apply for an individual fellowship (e.g. NSF Individual, NIH NRSA, or other) will be awarded \$250 from the Graduate School through the UAB Financial Aid office as a reward for submitting the application. To qualify for this award, the application must be reviewed prior to submission by the student's program director or mentor, who must provide a written verification to the Graduate School that the application is considered to be competitive. After submission of the grant application, the student will provide a PDF of the application to the Graduate School and the incentive reward will be authorized when the student provides evidence that the application has been received by the granting agency.
2. If a student's application is funded, the student will receive an additional financial reward.
  - a. For an NIH NRSA or other grant that provides less than the base stipend currently being offered to all students in that student's program, the student will receive supplementation of the fellowship stipend to an amount equal to the base stipend plus \$1,000 per year for the term that the grant is funded. If the stipend amount of the external award is equal to or greater than the equivalent of \$1,000 more than the current base stipend in the student's program, the student is entitled to receive the full amount of the stipend.
  - b. If a student receives an NSF predoctoral fellowship, he/she will receive no supplement to his/her stipend during the three-year term of the NSF fellowship. This stipulation is necessary because the NSF stipend of \$30,000 exceeds the current maximum stipend allowed by the Graduate School. After the NSF grant terminates, the student's advisor will be responsible for providing the current base stipend in that student's program and the Graduate School will provide the \$1,000 supplement until the student completes his/her degree requirements.

**Eligibility:** This plan is available to students in any graduate program discipline in which extramural individual fellowship funding is available. To be eligible for both the reward for submitting the application and the supplement to a student's stipend, the award must provide more than half the current base stipend in the student's program. Applications for and receipt of travel and other small grants will not be eligible for an incentive award under this program.

## Predocutorial Fellowship Awards in the Biomedical Sciences

### GENERAL FUNDING AND FELLOWSHIP PREPARATION RESOURCES

[Community of Science](#)

[ScienceCareers.Org](#)

[GrantDoctor](#)

[Career Development: Grants and Grant Writing](#)

[UAB Graduate School Professional Development Workshops](#)

(<http://www.uab.edu/graduate/programs/professional-development-program> )

Grants and Fellowships 101

Writing Fellowships

[UAB Office of Sponsored Programs](#) – UAB processing and forms

[UAB Financial Affairs](#) – Tax information regarding Fellowships and Scholarships

### FEDERAL FUNDING SOURCES

#### National Institutes of Health

[NIH Research Training Opportunities](#): Extramural Training Mechanisms

[NIH NRSA \(National Research Service Award\) Individual Predocutorial Fellowships](#)

[Individual Predocutorial Kirschstein - National Research Service Awards For M.D./Ph.D. Fellowships \(F30\)](#)

[Individual Predocutorial Kirschstein - NRSA Fellowships \(F31\)](#)

[Individual Predocutorial Kirschstein – NRSA Fellowships to Promote Diversity in Health-Related Research](#)

**IMPORTANT:** Not all NIH Institutes offer Individual Predocutorial NRSA Fellowships. Recipients must be US citizens or permanent residents.

#### **See below for Institute-specific NRSA Fellowship information:**

[National Institute of Allergy and Infectious Diseases \(NIAID\)](#)

[National Institute of Biomedical Imaging and Biomedical Engineering \(NIBIB\)](#)

[National Institute on Drug Abuse \(NIDA\)](#)

[National Institute of Neurological Disorders and Stroke \(NINDS\)](#)

[Funding for all NRSA Fellowships and Training Grants by Specific NIH Institutes](#)

**NRSA Stipend Levels** (note that the NRSA fellowship stipend is supplemented as required with additional funds to meet current UAB stipend levels)

FY 2012 (<http://grants.nih.gov/grants/guide/notice-files/NOT-OD-12-033.html> )

[NRSA Funding Policy concerning Tuition and Benefits](#)

#### NIH Dissertation Awards (R36)

[Aging Research Dissertation Awards to Increase Diversity \(R36\)](#)

[AHRQ Grants for Health Services Research Dissertation \(R36\)](#)

[NIDA Drug Abuse Dissertation Research: Epidemiology, Prevention, Treatment, Services, and Women and Sex/Gender Differences \(R36\)](#)

[NIMH Mental Health Dissertation Research Grants to Increase Diversity in the Mental Health Research Arena \(R36\)](#)

#### And for the Future – a sample of NIH *Postdoctoral* Funding Opportunities

[Individual Kirschstein Postdoctoral Fellowships \(F32\)](#) (offered by ALL NIH Institutes)

[NIH Pathway to Independence \(PI\) Award](#) (offered by all NIH Institutes)

[NIH Research Supplements to Promote Diversity in Health-Related Research](#)

### NIH Resources

[NIH Forms and Applications](#)

[Individual NRSA Forms and Instructions](#) (PHS 416-1)

[Individual NRSA Progress Report for Continuation Support Forms](#) (PHS 419-9)

### National Science Foundation

[NSF Graduate Research Fellowship Program](#)

[NSF Doctoral Dissertation Improvement Grants](#)

[Specialized Information for Graduate Students](#)

**Department of Defense** (<http://www.defense.gov/> )

**Department of Homeland Security** (<http://www.dhs.gov/> )

### PRIVATE ORGANIZATION SOURCES

[American Association of University Women\\*](#)

[American College of Rheumatology Medical and Graduate Student Achievement Award](#)

American Heart Association (<http://www.heart.org/HEARTORG/>)

[American Lung Association](#) (<http://www.lung.org/>)

[American Medical Association Foundation Seed Grants](#) (M.D./Ph.D. student interest)

[American Physiological Society](#): (minority fellowships, travel awards - <http://the-aps.org/>)

American Society for Microbiology (<http://www.asm.org/>)

[APA Predoctoral Fellowships in the Neurosciences](#) (<http://www.apa.org/pi/mfp/index.aspx>)

[Cystic Fibrosis Foundation](#) (summer or supplement awards)

[Crohn's and Colitis Foundation of America\\*](#) (supplement awards <http://www.cdfa.org/>)

[The Epilepsy Foundation](#)

[Lupus Foundation of America\\*](#) (summer or supplemental awards)

[PHRMA Fellowship Awards in Pharmacology](#) (one predoctoral application per institution)

[PHRMA Fellowships in Health Outcomes Research](#)

*\* Denotes awards that are not restricted by US citizenship eligibility requirement*

### UAB FUNDING SOURCES

The Graduate School resources guide (<http://www.uab.edu/graduate/area-3/current-students/90-funding-information-for-graduate-students>)

[Howard Hughes Medical Institute-funded UAB Hughes Med Into Grad Fellowship Program](#)

### Funding Resources to Enhance Diversity in Biomedical Research

#### FEDERAL SOURCES

[Agency for Healthcare Research and Quality](#)

[Individual Predoctoral Kirschstein – NRSA Fellowships to Promote Diversity in Health-Related Research](#)

[NIH Research Supplements to Promote Diversity in Health-Related Research](#)

[NIH NCI Opportunities for Training and Career Development for Minority Individuals](#)

[NIH NRSA Institutional Training Grants: Minority Supplements for NCI-Supported NRSA](#)

[NIH NAID Biodefense Research Training and Career Development Opportunities](#)

[NSF Graduate Student Travel Award](#) (for visiting prospective postdoctoral sponsors)

#### PROFESSIONAL SOCIETY SOURCES

[AACR Minority Scholar Awards in Cancer Research \(travel award\)](#)

[American Physiological Society](#):\* (minority fellowships, travel awards - <http://the-aps.org/>)

American Society for Cell Biology (<http://ascb.org/>)

[American Society for Microbiology](#) (<http://www.asm.org/>)

[FASEB/MARC Programs](#)

[FASEB MARC Travel Awards](#)

[Ford Foundation \(http://www.fordfoundation.org/\)](http://www.fordfoundation.org/)

[Graduate Women in Science Fellowships \(http://gwis.org/\)](http://gwis.org/)

[Society for Neuroscience Scholars Program](#)

[UNCF/Merck Science Initiative](#)

**Special Interest Training**

[AAAS Mass Media Science and Engineering Fellowship](#)

[Grass Fellowships in Neuroscience at the Marine Biological Laboratory](#) (14 week summer research program)

[The National Academies: Internship Program in Science Policy](#)

## Appendix C: Plagiarism

From <http://main.uab.edu/Sites/gradschool/students/orientation/7575/>

### What is plagiarism?

Using other people's work (in a variety of forms) in part or in whole and representing it as your own.

### What is documentation?

A systematic way of indicating the original source of the material or information used in your own work.

### Examples of two types of documentation format:

#### 1. Author-Date:

##### *In-text citation*

- According to Linden (1986). . . .
- Kanzi, a bilingual bonobo, has been instrumental in renewing interest in animal intelligence (Linden, 1986).

##### *Reference list:*

Linden, E. (1986). Silent partners: The legacy of the ape language experiments. New York: Times.

#### 2. Citation-Sequence:

##### *In-text citation:*

- According to Linden<sup>11</sup> . . . .
- Kanzi, a bilingual bonobo, has been instrumental in renewing interest in animal intelligence.<sup>11</sup>

##### *Reference list:*

11. Linden E. 1986. The legacy of the ape language experiments. New York: Times.

### What format style should be used for documentation?

- A style presented in a style manual commonly used by professionals in your discipline
- A style used by journals in your field
- A style presented in a style guide published by a professional organization in your field

### What are style manuals?

Style manuals are handbooks that give reference, layout format, and, in most cases, grammar and punctuation rules.

Three of the most commonly used style guides are

- *Publication Manual of the American Psychological Association (APA)*
- *Scientific Style and Format: The CBE Manual for Authors, Editors, and Publishers (now the Council of Science Editors--formerly Council of Biology Editors)*
- *American Medical Association Manual of Style*

### If I'm using a journal's style format, where do I find that?

Academic journals have a "Guide for Authors" or "Instructions for Authors," available either in the print journal or on their web site. You also should look at articles in the most recent issues of the journal.

### What needs to be documented?

- Another person's idea or opinion
- Anything published, including web materials
- Your own published work
- Interpretations
- Drawings or photographs
- Charts and graphs
- Lab results

- Lecture notes
- Professional presentations
- Techniques and procedures
- Surveys and test instruments

### **What does *not* need to be documented?**

Common knowledge

### **What is “common knowledge”?**

- “Bare-bone” facts from a dictionary or other basic reference books
- Dates, titles of principal works or studies, proper names
- Scientific and technical terms
- Example of common knowledge:  
“Watson and Crick proposed a spiral model of DNA, the double helix.”

### **How can you effectively and appropriately use secondary source material in your writing?**

- Direct quotation
- Copies the exact words of a source
- Is used sparingly in graduate-level writing
- Paraphrase
- Restates source information in your own words
- Assimilates research into a single style of writing to avoid awkward sentence structure, choppiness, or both
- Summary
- Condenses an entire article, chapter, book, or web source
- Is much shorter than the original
- Re-presentation
- Draws on original source material to create tables,

### **How can I effectively (and ethically) paraphrase?**

1. Read *and understand* the original source.
2. Use a highlighter pen *only* if you are going to write notes also.
3. Write the bibliographic information down carefully and completely.
4. Make notes using words, phrases, or a short string of words. Do NOT copy full sentences or long sections of text.
5. Leave the material for a period of time, at the very least several hours but preferably several days.
6. When you write *your* paper, use only the notes that you’ve taken.
7. *Never* write your paper while looking directly at the original text.
8. *Absolutely never* write your paper with photocopies of original texts in which sentences have been highlighted spread around you.
9. Place appropriate citations in your text to indicate sources.
10. After writing a complete section such as the background, verify details included in your paper by using the original text.
11. Add details or make other adjustments if what you have written misrepresents the original text.

### **Be prepared—Plan ahead!**

**Effective (and ethical) writing takes time.**