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## **INTRODUCTION**

### **Objective of Handbook**

This document summarizes for new entering graduate students and continuing graduate students the current academic requirements for the Master of Science Degree in the School of Biological and Health Systems Engineering (SBHSE). The handbook serves as a guide by outlining important deadlines, degree requirements and rules and regulations imposed by SBHSE, the Ira A. Fulton Schools of Engineering and the Office for Graduate Education - OGE (formerly Graduate College). It also outlines the standards of performance expected of all master's degree candidates. In some cases inconsistencies arise between the contents of the handbook and the Office of Graduate Education as policies are changed by the OGE and the Schools of Engineering. In these cases, the university's published rules and policies take precedence. **Please report any inconsistencies to the chair of the School's graduate committee.**

Students can use the departmental forms found on the SBHSE website:

<http://sbhse.engineering.asu.edu/>

You should bookmark and familiarize yourself with our website because it has important deadlines, checklists, seminar updates and more.

Office of Graduate Education forms are available at the website: <http://graduate.asu.edu/forms/>. OGE Offices are located in Interdisciplinary B Building, Room 170 and their webpage is <http://graduate.asu.edu/>. You should become familiar with the website as it is a resource you will use as an ASU student.

## Graduate Student Responsibilities

It is the responsibility of the graduate student to know and to observe all procedures and requirements as defined in this handbook, the Graduate Catalog, the Schedule of Classes, and the Guide to the Preparation of Master's Thesis. Students may access the Graduate Catalog at <https://catalog.asu.edu/>. The Schedule of Classes is available at <https://webapp4.asu.edu/catalog/>. The Guide to Preparation of the Master's Thesis is obtained from the Office of Graduate Education. Graduate students are expected to be familiar with the Code of Conduct, which is available in the Office of Student Affairs. *Violations of the Code of Conduct or incidents of dishonesty such as cheating in examinations, cheating in laboratory work or plagiarism are subject to university discipline whether committed by individuals or groups.* **Graduate students are expected to demonstrate satisfactory progress.** They are also expected to maintain the highest degree of academic integrity, enthusiasm for their academic studies and a high degree of intellectual curiosity; refer to <http://engineering.asu.edu/students/integrity>.

## Faculty Responsibilities

Faculty accepting responsibility of mentoring graduate students are expected to know and to observe the procedures and requirements defined in this handbook and the other publications listed above.

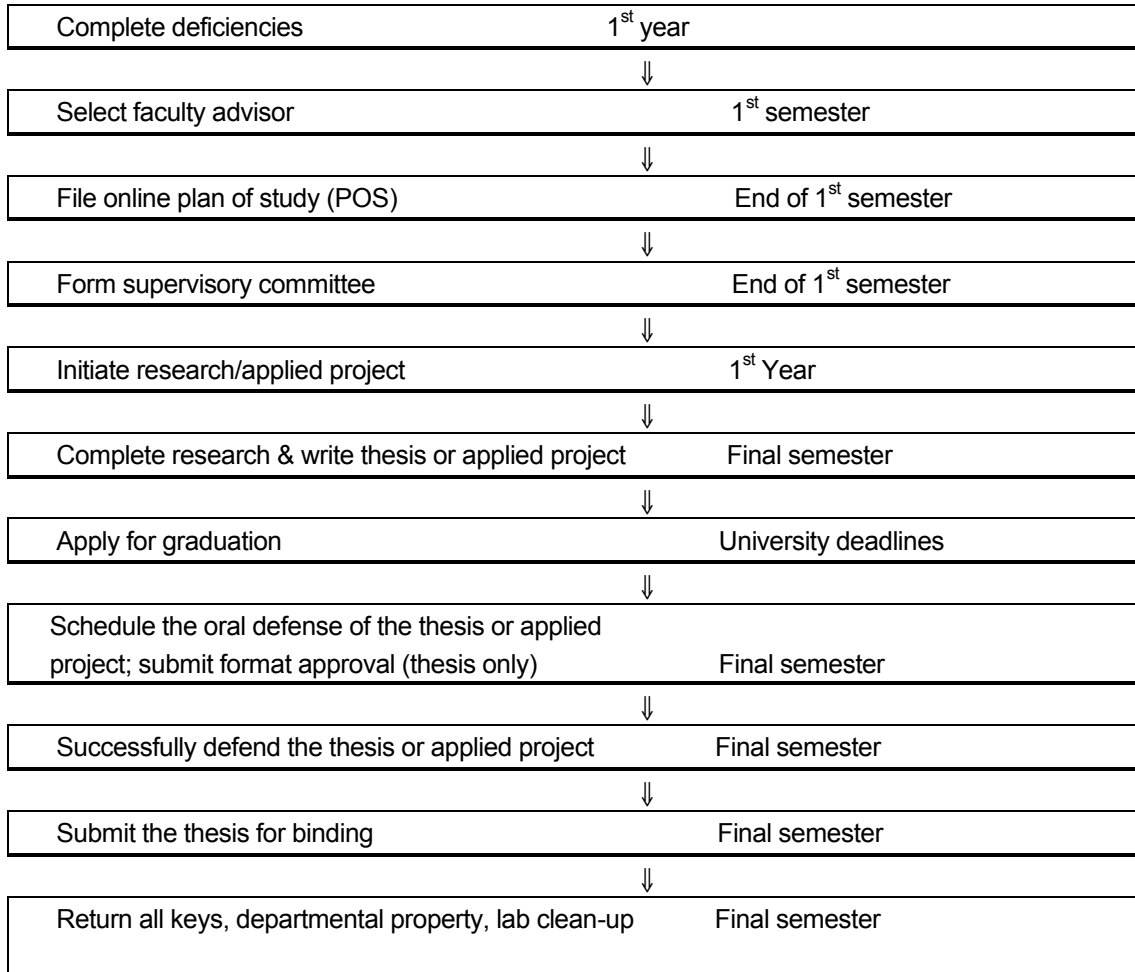
## Safety

The department is committed to providing a safe work environment for faculty, staff and students. Students are required to follow safe procedures in accomplishing their research and teaching assignments. All graduate students are required to attend a safety orientation outlining university, college and departmental safety guidelines and regulations. This orientation is typically held at the beginning of each fall semester. Students are required to take safety refresher courses EVERY year.

**Critical Path to the Master of Science Degree**

The student must accomplish several activities in the process of acquiring the master's degree. The flowchart below summarizes the chronological steps that must be followed in this process.

**CRITICAL PATH TO THE MASTER OF SCIENCE DEGREE**



**Graduate!**

## GOAL OF THE MASTER'S DEGREE PROGRAM

The master's degree program (Master of Science) combines coursework on advanced topics in the student's field of specialization with an introduction to research or applied project. The student is taught the scientific method by intensely studying a specific project. Generally, the master student's program of study advances the knowledge obtained in their broader undergraduate program of study. The professional master's program non-thesis option is designed to bridge the gap between knowledge of the engineering sciences and creative engineering practice. At the same time, it increases the depth and breadth of knowledge in selected areas of emphasis. All master's degree candidates are admitted to the program in the non-thesis program, and are expected to identify an appropriate applied project in consultation with a faculty mentor. Some students will find themselves engaged in research with a specific faculty member. If the student and faculty member agree that the research is likely to produce master's quality effort, the student can apply to transfer into the thesis option program.

## GENERAL ADMISSION REQUIREMENTS

### Regular Admission

To be eligible for regular admission, the student must have a Bachelor's degree in Bioengineering or Biomedical Engineering. United States citizens normally will have a minimum grade point average (GPA) of 3.2 out of a total possible 4.0 or equivalent. Foreign applicants normally will be in the top 10% of their graduating class. Students entering with master's degree are required to have a minimum GPA in their master's degree coursework of 3.5 out of a possible 4.0. The Graduate Record Exam (GRE) is required for all applicants. Foreign students must also submit test scores from the Test of English as a Foreign Language Exam (TOEFL). TOEFL scores should be close to 100 for admission.

### Regular Admission with Deficiencies

Regular admission may also be given to students with a Bachelor of Science degree in another discipline. In this case, however, the student may be required to take a number of undergraduate courses to eliminate deficiencies. These courses are in addition to the graduate program of study. Regular admission may also be given to students who are deficient in English (e.g. TOEFL <90). In this case, however, the student will be required to take and successfully complete courses through the ASU American English and Culture Program (AECF). The letter of admission specifies the deficiencies that must be completed before the student is awarded the graduate degree. Students will be required to complete any deficiencies at the first opportunity after admission.

### Provisional Admission

Applicants with scholastic records below the standards for regular admission may be admitted provisionally in certain special cases at the discretion of the departmental graduate committee with the approval of the chair of the graduate committee and the department chair. A student admitted with provisional status must make no grade lower than a "B" in their first 12 hours of graduate coursework. Full-time provisional students must take a minimum of nine (9) hours during their first semester in residence. [Part-time provisional students may take fewer than nine (9) hours of

coursework during their first semester.] Failure to satisfy these requirements will result in suspension from the program. Students who meet this requirement are reclassified as a regular graduate student and the regulations governing academic performance for regular students apply. **It is the student's responsibility to see that their status is changed from provisional to regular after having successfully completed these requirements.** Please contact your Graduate Advisor when you have fulfilled the provisional requirements.

## GENERAL GRADUATION REQUIREMENTS

The Office of Graduate Education (formerly Graduate College) sets certain general requirements for the master's degree. In addition to these general requirements, the department sets specific program requirements. These exceed those imposed by the Office of Graduate Education. All BME Master's students will be admitted into the program as a non-thesis, applied project student. Upon entry into the program, you will work with your faculty advisor to identify if you should move into the thesis track. The student must find a faculty mentor who agrees to provide the material and intellectual support for the student to complete the proposed thesis project. The request form to change to thesis can be found on the SBHSE website. Each track requires 30 credit hours of coursework.

This section outlines the general requirements specified by the OGE and by the department.

### General Requirements for the Master of Science Degree Thesis Option

#### Grading

Grades are assigned in graduate courses as follows:

|    |                           |
|----|---------------------------|
| A+ | 4.33                      |
| A  | Excellent 4.00            |
| A- | 3.67                      |
| B+ | 3.33                      |
| B  | Good 3.00                 |
| B- | 2.67                      |
| C+ | 2.33                      |
| C  | Passing 2.00              |
| D  | No Graduate Credit 1.00** |
| E  | Failure 0.00**            |
| W  | Withdrawal*               |
| I  | Incomplete                |
| X  | Audit                     |
| Y  | Satisfactory              |
| Z  | Course in progress***     |

\* This grade is given whenever a student officially withdraws from a class.

\*\* This grade cannot be applied to a graduate degree but is included in the calculation of a grade point average.

\*\*\* This grade is usually given pending completion of courses such as thesis or practicum. All grades of "Z" that appear on the plan of study must be changed to "Y" before graduation. A student cannot graduate with an "I" on their transcript so all courses where an "I" has been issued must have some grade resolution.

A grade of "P" (Pass) in a 400 or higher level course may not appear on a program of study. Grades of "D" or "E" cannot be used to meet the requirements for a degree although they are used to compute the grade point averages. A student receiving a grade of "D" or "E" must repeat the course in a regularly scheduled (not an independent study) class if it is to be included in the program of study. However, both the "D" or "E" and the new grade are used to compute the grade point averages. Grades on transfer work will not be used in computing grade point averages.

### **Repeating ASU Courses**

Graduate students (degree or nondegree) may retake any course at any level at ASU, but all grades remain on the student transcript as well as in GPA calculations

### **Scholarship**

To be eligible for a graduate degree, the Office of Graduate Education stipulates that a student must achieve two grade point averages of "B" (3.00) or better. The first grade point average is based on all courses numbered 500 or higher which appear on the transcript. (Courses noted as deficiencies in the original letter of admission are not included.) The second grade point average is based on all courses that appear on the program of study. Academic excellence is expected of students doing graduate work.

Upon recommendation from the chair of the Graduate Program in Biomedical Engineering, the Director of the Office of Graduate Education can withdraw a student who is not progressing satisfactorily.

### **Good Standing**

A student who has been admitted to a graduate degree program in Engineering, with either regular or provisional admission status, must maintain a 3.0 or higher grade point average (GPA):

1. in all work taken for graduate credit (courses numbered 500 or higher),
  2. in the coursework in the student's approved program of study, and
  3. in all course work taken at ASU (overall GPA) post baccalaureate.
- A. A student will be placed on academic probation if one or more of the student's GPAs listed above falls below 3.0. Students will be notified by mail when placed on academic probation.
  - B. A student will earn academic good standing by obtaining a 3.0 or better in the GPAs listed above by the time the next nine hours are completed. Coursework such as research and dissertation registration that are for Z or Y grade cannot be included in these nine hours.
  - C. A student may be recommended for dismissal from a graduate program if the student fails to increase all of the GPAs listed above to 3.0 or better by the time he/she completes at least nine credit hours as defined in section B.

A student may appeal actions concerning dismissal by petitioning the departmental unit in which they are enrolled.

## Misconduct

The highest standards of academic integrity are expected of all students. The failure of any student to meet these standards may result in suspension or expulsion from the university and/or other sanctions as specified in the academic integrity policies of the individual colleges. Violations of academic integrity include, but are not limited to, cheating, fabrication, tampering, plagiarism, falsification or misrepresentation of data or facilitating such activities. The university and college academic integrity policies are available in the Office of the Senior Vice President and Provost and the offices of the deans of the individual colleges.

## Graduate Credit Courses

Courses at the 500, 600 and 700 levels are graduate credit courses. Courses at the 400 level satisfy graduate degree requirements when appearing on an approved program of study. There is a limit of 6 credits of 400 level courses that can be included on the plan of study.

## Transfer Credit

Transfer of credit is the acceptance of credit from another institution for inclusion in a program of study leading to a degree awarded by ASU. Transfer of credit can also apply to credits taken at ASU as a non-degree student.

Transfer credits may not be applied toward the minimum degree requirements for an ASU degree if they have been counted toward the minimum requirements for a previously-awarded degree.

The number of hours transferred from other institutions may not exceed 20 percent of the total minimum semester hours required for a master's degree unless stated otherwise for a specific degree program. Up to 12 semester hours of credit taken at another institution and not counted toward a previous degree may be counted toward the minimum semester hours required for a specific ASU graduate degree program. In all cases, the inclusion of transfer courses on a program of study is subject to approval by the academic unit and the Office of Graduate Education.

Certain types of graduate credits cannot be transferred to ASU, including the following:

1. credits awarded by postsecondary institutions in the United States that lack candidate status or accreditation by a regional accrediting association;
2. credits awarded by postsecondary institutions for life experience;
3. credits awarded by postsecondary institutions for courses taken at noncollegiate institutions (e.g., government agencies, corporations, and industrial firms);
4. credits awarded by postsecondary institutions for noncredit courses, workshops, and seminars offered by other postsecondary institutions as part of continuing education programs;
5. credits given for extension courses; and
6. credits completed before the posting of a bachelor's degree.
7. Acceptable academic credits earned at other institutions that are based on a unit of credit different from the ones prescribed by the Arizona Board of Regents are subject to conversion before being transferred to ASU.

Transfer credits must be acceptable toward graduate degrees at the institution where the courses were completed. Only resident graduate courses (at the institution where the courses



were completed) with an "A" (4.00) or "B" (3.00) grade may be transferred. A course with the grade of pass, credit, or satisfactory may not be transferred. Additionally, transfer credits must be within the six-year time limit to be used on a master's plan of study.

Official transcripts of any transfer credit to be used on a plan of study must be sent directly to the Graduate Admissions Office from the Office of the Registrar at the institution where the credit was earned.

### **Concurrent Degree**

Concurrent degrees may be available, enabling qualified graduate students to pursue two graduate degrees. Students **must** petition both departments and receive approval. NOTE: One-sixth or twenty percent (1/6) of the total combined hours may be used on the two degrees. (i.e. two 30 hours degree = 60 hours hence 10 hours may be used in both degrees.)

### **Course Load**

Course load is not to exceed 12 semester hours of credit during each of the two semesters, 6 semester hours during each 5-week summer session, or 9 semester hours of credit during the 8-week summer session unless a petition is submitted and accepted by the School.

**All graduate assistants and associates (RA/TA) must enroll for a minimum of 12 credit hours** (including research during each semester of their employment). This departmental requirement exceeds the Office of Graduate Education minimum of six (6) hours. The hours cannot include audit enrollment. A half-time (50%) graduate assistant or associate working 20 clock hours per week may not register for more than 12 hours of coursework each semester, a third-time (33%) assistant or associate for more than 13 hours and a quarter-time (25%) assistant or associate for more than 15 hours. Graduate assistants and associates (RA/TA) may petition to exceed these limits for a semester.

During the summer session, graduate assistants and associates must be enrolled in at least one credit in coursework related to their degree program in one of the summer session terms. Graduate assistants and associates employed 25% time may enroll for a maximum of 6 semester hours during a 5-week session or 9 hours during an 8-week session; those employed 50% may enroll for a maximum of 5 hours during a 5-week session or 7 hours during the 8-week session and those employed 100% time may enroll for a maximum of 3 hours during the 5-week session or 4 hours during the 8-week session. Courses taken in the summer that are not in the program of study may not be covered by tuition award.

All graduate students who are doing research, working on thesis or dissertations, taking comprehensive final examinations or using university facilities or faculty time must be registered for a minimum of one hour of credit that appears on the program of study or is an appropriate graduate level course.

The student is expected to enroll continuously, excluding summer sessions, until all requirements for the degree have been fulfilled.

### **Graduate Student Orientation**

All new entering graduate students are encouraged to attend a departmental graduate student orientation meeting held the week prior to the beginning of classes their first semester in residence.

During this orientation meeting, students are advised regarding program and SBHSE policies and are given initial advice regarding registration for courses. Students are also required to meet individually with the graduate student program advisor to obtain advice regarding which graduate courses should be taken and to have their registration forms signed. We also recommend the students identify a faculty member with whom they can consult on these matters.

### **Supervisory Committee**

All students admitted with regular or provisional status are required to establish a graduate supervisory committee. The committee must be selected no later than the end of the first year of residence. **Forms are available on the SBHSE website.** This committee is responsible for the guidance and the direction of the student's graduate program. The supervisory committee is comprised of a minimum of three members, including a chair. During the early phase of the student's graduate program the committee advises the student regarding which courses should be included in his/her program of study. Generally, the chair of the supervisory committee is the student's research advisor. The committee is also responsible for approving the student's research proposal, the title of the master's thesis and for conducting the final defense of the master's thesis. The supervisory committee is appointed by the Dean of the Office of Graduate Education upon the recommendation of the head of the Department of Bioengineering.

In some cases, individuals who are not members of the resident faculty may be appointed to a supervisory committee as a main or extra member. Such appointments must be consistent with quality graduate training and must be strongly recommended by the chair of the department. Curriculum vitae for this individual must be submitted to the Office of Graduate Education with a recommendation from the chair of the department.

**The committee chair is generally a tenure track faculty member in the Graduate Program of Biomedical Engineering, in instances where the student selects a chair of the supervisory committee who is not a member of the program with endorsement to chair, two co-chairs must be appointed instead. The co-chair must be listed on the Graduate college BME Faculty list with endorsement to chair.**

When the student elects to have co-chairs, a letter outlining the responsibility of each co-chair must be submitted to the chair of the graduate committee. Generally, one co-chair is responsible for the student's research program. The second co-chair is responsible for the student's program of study and enforcement of departmental policies and requirements.

### **Plan of Study**

The student is required to file a plan of study with the School of Biological and Health Systems Engineering and the Graduate College after completing 50% of their degree plan credit hours, typically during the second semester. The plan of study (iPOS) will be available on MyASU. Changes in the planned program may be made with the approval of the student's program committee and the approval of the head of SBHSE.

### **Thesis**

To satisfy the research requirement for the Master of Science degree with Thesis, the student is expected to present a thesis, which is defended in an oral examination. The thesis should be of high quality, giving evidence that the program provided an introduction to research. The final approved copy will be bound and placed in the university library and in the department office. Students should review the Graduate College website <http://graduate.asu.edu/> for details and deadlines. Each student writing a thesis must register for and complete a minimum of 3 semester

hours of thesis and 3 semester hours of research. These 6 semester hours of research and thesis are directed to a common research problem. Credit taken to fulfill the thesis enrollment requirement must appear on the program of study. Students must be enrolled for at least 1 hour of credit that appears on the program of study or 1 hour of appropriate graduate level credit during the semester or summer session in which they defend the thesis.

## **Oral Defense of the Thesis**

The final oral examination in defense of the thesis is mandatory and must be held on the campus of Arizona State University. The student will complete the Thesis Defense Schedule Form to schedule the thesis and get approval by the supervisory committee and the dean of the Graduate College to schedule the oral defense.

Please review the following website for additional deadlines and thesis requirements: <http://graduate.asu.edu/>.

The oral defense of the student's thesis is a formal occasion and the student should treat it as such by dressing appropriately and scheduling the meeting for an appropriate seminar room. It is the responsibility of the student to arrange for all audiovisual aids and to request a room using forms available on the SBHSE website.

At the beginning of the examination, the student's research advisor introduces the student and the topic of their research to the general audience. The student is then expected to present a brief seminar outlining the results of their research. The presentation should be limited to 30 minutes. Following the presentation by the student, the general audience is invited to ask questions. Following this question and answer session, the general audience is excused and the student's committee continues to question the student in depth regarding his/her research findings. The student should be prepared to defend the research methodology used in the study and the results obtained.

The oral defense of the thesis is limited to a period of three hours. If necessary, however, the proceedings may be adjourned and rescheduled for a mutually convenient date within one week. Only one adjournment is permissible. When the committee completes its questioning, the student is asked to leave the room and the committee discusses whether or not the student successfully defended their research and whether or not the completed thesis is acceptable.

### **LEVEL OF PASS OR FAIL**

**Pass: Only minor format corrections need to be made (e.g., typographical errors, and pagination).** At the conclusion of the defense, 1) the committee chair should indicate "pass" and briefly describe needed revisions, and 2) all committee members should report the examination results at the bottom of form and sign the thesis approval page.

**Pass with minor revisions: Extensive format/editorial corrections and/or minor substantive changes need to be made (e.g., rewrite some text, correct grammatical errors).** At the conclusion of the defense, 1) the committee chair should indicate "pass with minor revisions" and briefly describe revisions, and 2) the committee members, not including the chairperson, should report the examination results at the bottom of the form and sign the thesis approval page. 3) After revisions are made, the chairperson should report the exam results at the bottom of the form and sign the thesis approval page.

**Pass with major revisions: Extensive substantive changes need to be made (e.g., chapter rewrite).** 1) At the conclusion of the defense, the committee chair should indicate "pass with major

revisions" and briefly describe revisions. 2) After revisions are made, all committee members should report the examination results at the bottom of the form, and sign the thesis page.

**Fail: The basic design and/or overall execution of the study are flawed or the candidate's performance in the oral examination is seriously deficient.** At the conclusion of the defense, 1) the committee chairperson should indicate "fail", and 2) all committee members should report the examination results at the bottom of the form. The thesis approval page should not be signed.

The results of the oral defense are conveyed to the student by the chair of the committee. The results are transmitted to the Graduate College on the "Thesis Defense Form" following the approval of the chair of SBHSE.

## Applying for Graduation

The student is eligible for graduation when the Graduate College scholarship requirements are met, the final oral examination is passed and the thesis is approved by the committee and accepted by the Chair of SBHSE and the Dean of the Graduate College; and after the required number of dissertation copies are submitted to the bookstore for binding.

Application for graduation should be made no later than the date specified in the Graduate College calendar (Refer to Graduate College website for current information). All fees are payable at this time. The student applies for graduation by

- Paying a graduation fee at the Cashier's Office in the Student Services Building
- Taking the receipt to the Graduation Office, and
- n Completing the Application for Graduation form provided by the Graduation Office.

An additional late fee will be assessed if these procedures are completed after the date specified in the Graduation Catalog calendar. If the student wishes to apply the filing fee to a subsequent semester, he/she must withdraw the application no later than the application deadline. During the summer, the graduation application must be withdrawn by the last day of the five-week summer session. If a student does not complete all degree requirements by the date of graduation for which he/she has applied and has not withdrawn the application by the designated time, a fee must again be paid to reapply.

## Format Approval

For format, Graduate College must review the final copy of the master's thesis. Details and deadlines are at the Graduate College website.

## Enrollment

Students must be enrolled for at least one hour of credit that appears on the iPOS or one hour of appropriate graduate-level credit during the semester or summer session in which they defend a thesis.

**Summer:** During the summer session, enrollment in any one of the summer sessions will fulfill the requirement.

**Break Period.** Students with an oral defense scheduled during a break period must be enrolled in both the proceeding semester and the following semester, including summer term. If the break is between the summer and fall, enrollment during any one of the summer session will fulfill the requirement.

### **Applied Project Defense**

The student's supervisory committee administers the examination. A written report of the project is submitted to the student's supervisory committee and then a poster or oral defense engages the committee and the candidate in a critical analytical discussion of the applied project. The poster defense should be in coordination with the Senior Capstone or BME day poster sessions. An alternate date for a poster or oral defense can be used if necessary and agreed upon by the student's supervisor committee. Following the project defense, the student will be evaluated by the committee and given a pass/fail grade for the Applied Project.

### **Graduation**

The student is eligible for graduation when all coursework is successfully completed and a final program of study is approved and filed with the Graduation Office; the Graduate College scholarship requirements are met; the thesis or applied project is approved by the supervisory committee and accepted by the head of the School of Biological and Health Systems Engineering and the Dean of the Graduate College; and the required number of thesis copies are submitted for binding.

### **Foreign Language Requirement**

None.

### **Maximum Time Limit**

*All work offered toward the master's degree must be completed within 6 consecutive years. The six years begin the initial enrollment into the masters program. Any exception must be approved by the supervisory committee and the dean of the Graduate College.*

### **Research Seminar Requirements**

In addition to the coursework and thesis requirements, all full-time thesis-master's degree students must successfully complete a research seminar course at least three times.

## **SELECTION OF A RESEARCH TOPIC (Thesis)**

The selection of a suitable research topic for the thesis is of paramount importance to a successful graduate program. **The selection of the research topic is the responsibility of the student.** Students are urged to select a topic and a research advisor early in their program of study, no later than the end of the first semester in residence. To accomplish this, the student visits with faculty members and selects an advisor and thesis topic that matches his/her goals and interests. The department does not guarantee that a student will be selected to work on a specific project offered by a given faculty member. This is particularly true of funded research projects. Several students often desire the same project in the case of funded research. For this reason, the student should express interest in several projects being offered by various faculty members. The department does not require the faculty to advise students on projects of this nature. In all cases, the student must obtain the agreement of a faculty member to serve as the research advisor and chair of the supervisory committee. The student is also responsible for enlisting faculty to serve as members on the student's supervisory committee.

The research advisor (or major professor) works closely with the student to help plan his/her overall program and to coordinate coursework and research activities. Generally, the advisor helps the student select other members of his/her supervisory committee. Frequent contact between the student and the advisor is necessary to accurately define the research project. This helps to ensure that the student's research thesis topic is acceptable. The thesis topic is initiated by either the student or the faculty research advisor.

Research by nature is not precisely programmed. Often, well-planned experimental designs are unsuccessful. This often requires the application of different methods and procedures after the project is well underway. For these reasons, students are encouraged to initiate their thesis research even before they are able to devote full-time to the project. This helps to eliminate unnecessary delays in graduation. Original work is desirable in pursuing the Master of Science degree. One or more research publications or presentations should result from the research project.

Throughout their program of study, the student is encouraged to actively participate in efforts to acquire funding in support of the advisor's research program. The student should assist his/her research advisor in the preparation of grant proposals and/or progress reports to local, state and national agencies.

## **SPECIFIC PROGRAM REQUIREMENTS**

In addition to the general requirements listed above, the department has established additional specific requirements for the Biomedical Engineering major.

### **Master of Science Degree – Non-thesis Option**

#### **Admission Requirements**

The Master of Science degree in Biomedical Engineering provides an in-depth study of topics through advanced coursework and an introduction to research. The non-thesis, Applied Project option will be selected when completing your online Plan of Study (iPOS) after the first semester. All master's students are admitted under this program.

#### **Course Requirements**

The student's program of study will consist of 30 credit hours as follows:

**Biomedical Engineering Courses.** 13 semester hours of coursework must be selected of 500 level BME prefix courses approved by the student's supervisory committee and the department graduate committee.

**Quantitative Electives.** 6 semester hours of graduate-level mathematics coursework (400 - 700 level) must be selected. Graduate committee has approved a list of courses that satisfy this requirement. Please see the list of approved quantitative electives on the SBHSE website or your graduate advisor for more information.

**General Electives.** The student must select 6 semester hours of general electives, of which 3 semester hours must contain engineering science or engineering design content. All of the elective courses must be at the 400, 500 or 700 level.

**Applied Project.** Students admitted to the non-thesis option must also register for 3 semester hours of BME 593 Applied Project. Students are required to complete an in-depth literature survey or a device/process/research design project in some aspect of Bioengineering resulting in a written report and a poster or oral presentation.

**Seminar.** All students must have a minimum of 2 semesters in seminar (BME 591 Seminar, 1 credit each semester) included in the program of study.

Candidates whose undergraduate degree was in a field other than Bioengineering may be required to complete more courses. (see Transition Program below).

Additionally, prior to receiving the master's degree, the student must present evidence of having completed the following courses at either ASU or their undergraduate institution:

- Biochemistry or upper level Biology (1 semester)
- Coursework including experience with measurements on living systems (1 semester)
- Physiology (1 semester)

**Defense of the Applied Project.** The student is required to successfully defend the Applied Project before his or her graduate supervisory committee.

**Financial Aid.** Teaching or Research Assistant/Associate (TA/RA) positions are typically reserved for doctoral students. Master's students are encouraged to explore financial opportunities offered by the Fulton Deans and ASU Graduate College.

## **Master of Science Degree Thesis Option**

The Master of Science degree in Biomedical Engineering provides an in-depth study of topics through advanced coursework and an introduction to research. You must have approval of a faculty member willing to work with you before choosing this option.

### **Course Requirements**

The student's program of study will consist of 30 credit hours as follows:

**Biomedical Engineering Courses.** 9 semester hours of coursework must be selected of 500 level BME prefix courses approved by the student's supervisory committee and the department graduate committee.



**Quantitative Electives.** 6 semester hours of graduate-level coursework with substantial quantitative content (400 - 700 level) must be selected. Graduate committee has approved a list of courses that satisfy this requirement. Please see a list of approved courses on the SBHSE website or consult your graduate advisor for more information.

**General Electives.** The student must select 6 semester hours of general electives, of which 3 semester hours must contain engineering science or engineering design content. All of the elective courses must be at the 400, 500 or 700 level.

**Research/Thesis.** The student must register for 6 hours thesis, BME 599. Students can and generally do register for research, BME 592, but this will not be included on your plan of study as it is not required for the degree.

**Seminar.** All students must have a minimum of 3 semester hours of credit in seminar (BME 591) included in the program of study.

Candidates whose undergraduate degree was in a field other than Bioengineering may be required to complete more courses. (see Transition Program below).

Additionally, prior to receiving the master's degree, the student must present evidence of having completed the following courses at either ASU or their undergraduate institution:

- Biochemistry or upper level Biology (1 semester)
- Coursework including experience with measurements on living systems (1 semester)
- Physiology (1 semester)

**Admission to the PhD Program.** If the student wishes to enter the PhD program after completing the requirements for the master's degree, the application procedure will be the same as if the student were applying for the PhD degree directly out of a BSE. The Graduate College will allow a "blanket transfer" of 30 credit hours toward the PhD from an earned Master's degree.

## Transition Program Requirements

Students without a Bachelor's degree in Bioengineering and without the equivalent of the following courses in their undergraduate program of study are deficient in some skills needed for graduate study in Bioengineering. These courses must be completed at the first opportunity in addition to the required graduate coursework.

**Mathematics:** Calculus through "Ordinary Differential Equations" (e.g. MAT 270, 271, 272 and 274; typically at least 13 semester hours credit total).

**Physics:** One year of calculus-based physics including laboratory (8 semester hours).

**Biology:** Minimum of one "General Biology" course (4 semester hours).

**Chemistry:** Minimum of one chemistry course including laboratory (4 semester hours).

**Computers:** Demonstration of computer literacy (e.g. via course, exam).

**General Engineering Fundamentals:** Students without the equivalent courses must complete additional course work in four of the following six topics:

- Thermodynamics
- Fluid Mechanics
- Mechanics of Rigid Bodies
- Electrical Networks
- Signals and Systems
- Materials Science and Engineering

## **FINANCIAL SUPPORT**

Teaching or Research Assistant/Associate (TA/RA) positions are typically reserved for doctoral students. Master's students are encouraged to explore financial opportunities offered by the Fulton Deans and ASU Graduate College. Please do not contact individual faculty regarding financial opportunities or positions within their labs.

### **Scholarships**

The Graduate College provides funding for out-of-state tuition waivers and in-state tuition waivers for outstanding students recommended by the department if funds are available. Students apply for these awards provided by the Graduate College. The completed forms are submitted to the departmental office. Generally students receiving research assistantships or teaching assistantships qualify for out-of-state tuition waivers. Only a very limited number of in-state tuition waivers are available. These are awarded to the students with the most outstanding academic credentials.

## **ACCESS TO DEPARTMENTAL STAFF AND FACILITIES**

### **ISAAC and Building Access**

ISAAC (key card) provides access for the offices and laboratories in the Ira A. Fulton School of Engineering: Engineering Research Center (ERC), ITBS1, Schwada (SCOB) Classroom Office Building, and Goldwater Center (GWC) are obtained by filling out an online ISAAC form available on the SBHSE website. The student's research advisor and an authorized department signor must also sign the form.

### **Office Equipment**

Graduate students are not permitted to use office (computers, printers) without School approval. Students are urged to familiarize themselves with the extensive free computer facilities on campus available for word processing.

## Copier

The SBHSE copier is for faculty and staff use. Faculty may authorize their students to use the copier for teaching duties or for research. Large jobs (greater than 100 copies) require approval by the school's Business Operations Manager. No personal copying can be done on the departmental machine. Pay copiers are available at many locations on and off campus.

Misuse of departmental telephones, copiers, supplies, facilities is a serious offense that will lead to disciplinary action. At a minimum, students found to have used departmental resources for non-department approved purposes will be required to reimburse the department for such uses.

## Miscellaneous

SBHSE announcements and important information are listed on the SBHSE website and the student's MyASU.

Email etiquette:

You will have many reasons to communicate with instructors and staff outside of class. The preferred method of communication is via email.

Two rules that you should follow:

1. Begin the Subject Line of your message with a course designator such as "BME 213: Ethics"
2. Keep all communications professional in tone. Begin your email with a proper salutation (Dear Dr. ..." or "Dear Professor..." , etc.) Be direct, clear, and brief with your questions or comments. Do not make demands of your instructor or staff member. Proofread your note prior to sending it: misspelled words and grammatically incorrect constructions generate a bad impression. And please, don't pepper your message with exclamation points and emotions.

\*Emails which violate rule 2 will either be ignored or returned with editorial comments.

Here is an example of an inappropriate email:

To: BME294 Instructor

Subject: Yo

Dude its freakin hot out today!!! ASU should get it's act together and build like enclosed walkways or something for us!!! Right?? Its cool I guess ;) Anyway, yo, I could get the answer sheet today cuz their all gone. Put on on your door and I'll snag it tonight.

L8trs.

A much more appropriate email:

To BME213 Instructor

Subject: BME 213: Answer Sheet

Hello Professor,

I was unable to get to class to pick up an answer sheet today. Would there be a time that I might come by to pick one up?

Thank you.

Student