



**J. CRAYTON PRUITT FAMILY
DEPARTMENT OF BIOMEDICAL ENGINEERING
(BME)**

GRADUATE PROGRAM GUIDELINES

2018/2019

This Guide contains information that supplements the University's Graduate Catalog which is the primary document governing all academic programs. Although every effort has been made to maintain accuracy, the J. Crayton Pruitt Family Department of Biomedical Engineering reserves the right to correct errors when found, without further notice to students. The presence of errors will not affect the application of the rules and requirements applicable to all students.

GRADUATE PROGRAM GUIDELINES

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DEPARTMENT MISSION AND GRADUATE PROGRAM OBJECTIVES

The mission of the J. Crayton Pruitt Family Department of Biomedical Engineering (BME) is to educate students with strong engineering and science backgrounds for Master's and/or PhD degrees in Biomedical Engineering so that they can productively apply their training to the solution of engineering problems in medicine, biology and related fields.

Biomedical Engineering Graduate Program Objectives

1. Provide students with a strong knowledge base of biomedical engineering and specialized knowledge and experience in at least one of the core areas: Biomaterials & Regenerative Medicine; Biomechanics & Bionics; Biomedical Imaging & Applications; Molecular & Cellular Engineering; Modeling & Biomedical Data Science; and Neural Engineering.
2. Provide students with the ability to apply fundamental engineering principles to identify, analyze, and solve clinical problems and improve health care.
3. Provide students with the ability to design and conduct scientific and engineering experiments, and to analyze and interpret the resulting data.
4. Provide students with experience and understanding of design requirements and constraints in the clinical and biological science environment, including technology transfer.
5. Provide students with the skills needed to communicate effectively, work collaboratively, and understand their professional and ethical responsibilities and the impact of clinically significant engineering solutions in a societal and economic context.

The field of biomedical engineering is highly interdisciplinary and collaborative, with interactions with other engineering and science disciplines and with clinical practice. As such, the graduate programs in BME benefit from other departments in the College of Engineering (COE) and the College of Medicine (COM) acting as partners in the education of Biomedical Engineers.

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INTRODUCTION

The Department of Biomedical Engineering (BME) at the University of Florida offers the Master of Engineering (ME), the Master of Science (MS) and the Doctorate of Philosophy (PhD) degrees in Biomedical Engineering. The BME Graduate Program Guidelines detail the policies and regulations governing these programs and should be used in conjunction with the global University of Florida Graduate Guidelines. It is **the responsibility of the student** to be familiar with both publications and to adhere to the stated rules.

Requirements for Degrees

A summary of the pertinent degree requirements are shown in the table.

SCH (Semester Credits Hours) Requirements (minimum number)	Master (Thesis)	Master (Non-thesis)	Doctor of Philosophy
Total SCH	30 ^a	30 ^a	90 ^{a,b}
BME Core Requirements	10	10	9
BME Electives	6	6	6
Specialization Electives ^c	9	13	12
Supervised Teaching	N/A	N/A	4
Research/Special Project	5	1	(var)
Supervisory committee members (minimum number)	3	1 ^d	4
Comprehensive Exam	None	None	Yes
Qualifying Exam	None	None	Yes
Final Exam	Oral and Written	Written ^e	Oral and Written
Time limit for completing degree	7 years	7 years	5 years ^f

- a. Beyond BS
- b. May include credit hours from Master's program
- c. Graduate level coursework with the College of Engineering (COE) or College of Medicine (COM)
- d. Supervisory Chair only
- e. Capstone project supervised by Supervisory Chair
- f. 5 years from admission to Ph.D. Candidacy.

1. GENERAL INFORMATION

1.1. Graduate Academic Office

The Graduate Academic Office (GAO) serves as the graduate advising and administration unit and is administered by the Associate Chair of Graduate Studies, Graduate Coordinator and the Graduate Advisor. The Graduate Advisor serves to assist graduate students in admission, deadlines, course requirements, registration, and routine administrative issues. The Associate Chair of Graduate Studies is responsible for overall program administration and policy directions, while the Graduate Coordinator serves to provide general guidance on student advising, standard petitions, and coordination of the MS program. Inquiries regarding the graduate program should first be made to the Graduate Advisor (grad@bme.ufl.edu), which can then be forwarded to the Graduate Coordinator or the Associate Chair, as needed. The Graduate Advisor holds office hours. The Graduate Program Coordinator and Associate Chair schedule ad hoc appointments to meet with any student. Email grad@bme.ufl.edu or the professors directly to schedule an appointment.

1.2. BME Graduate Program Committee

The BME Graduate Program Committee (GPC) serves to assist the graduate chair in the operation of the BME Graduate Program, ensuring policy compliance with both BME and the overall Graduate School, overseeing admission of incoming students, suggesting and approving policy changes, and reviewing student petitions. A student may petition the BME GAO and GPC with academic issues by submitting a formal written request with the GAO (see Section 1.13 for further information).

1.3. BME Graduate Student Council

The purpose of Biomedical Engineering Graduate Student Council (GSC) is to 1) provide an agency for the coordination of biomedical engineering student activities to promote common goals and interests of the BME graduate student body, 2) advance and enrich the academic and educational experience of graduate students in the UF BME Department, and 3) seek the improvement of BME graduate student education through active communication and representation between BME students and faculty, and other governing bodies at the University of Florida such as the Graduate Student Council and UF Student Government. All BME graduate students are welcome to attend GSC meetings and are encouraged to become involved in this organization. See the website for more information: <http://gsc.bme.ufl.edu/>

1.4. Graduate Guidelines and Catalog Year

The catalog year determines the set of academic requirements that must be fulfilled for graduation from the program. Students graduate under the catalog in effect when they begin enrollment for that particular degree at UF, provided they maintain continuous enrollment. A catalog year runs from Summer B of one year to Summer A of the next year (e.g. for this catalog Summer B 2017 to Summer A 2018). Students who are unregistered for 2 or more consecutive terms must reapply for admission and will be assigned the catalog in effect when enrollment is resumed. Students transitioning to a more advanced degree (e.g. Masters to Doctoral) must follow the catalog year in effect when they begin the new degree program. Students may request to be assigned a catalog year *later* than their original enrollment term by filling out a catalog year change form (see BME website). If a student wishes to be assigned an earlier year, they must file a petition, with appropriate justification, to the BME GPC.

1.5. Graduate Assistantships and Fellowships

The Department of Biomedical Engineering offers Graduate Assistantships and Fellowships/Awards to select students in good academic standing. Stipend minimums are defined by the department. All doctoral students that complete their application to the program by the posted academic deadlines of the department are automatically eligible. Additional assistantships may be sponsored by the Doctoral Chair. Students are highly encouraged to apply for external fellowships such as NSF, NIH NRSA, NDSEG, DoD, DoE, and DoHS. See the BME website for more information on these opportunities (see our website under student resources).

Masters applicants that are not Florida residents are eligible to receive Achievement Awards, which off-set tuition costs. MS applicants should apply by posted deadlines to be automatically eligible. Additional MS support is available via the Latin American Caribbean Scholarship (<https://internationalcenter.ufl.edu/latin-american-caribbean-lac-scholarship>). Students who meet eligibility criteria should contact the GAO for more details on how to apply.

Typically, students on assistantships or fellowships/awards cannot conduct outside work, as the combination of a 0.5 FTE appointment and a full-time course load greatly exceeds 40 hrs per week. If a student receiving financial support for their degree seeks to engage in outside work, this must be approved by the supervisor and the Associate Chair for Graduate Programs and be within the guidelines of the assistantship/fellowship. Further, all students appointed in BME must formally disclose and be approved for any Outside Activities and Financial Conflict of Interests, which include both paid and unpaid outside appointments of any format (part-time, consulting, etc). <https://research.ufl.edu/faculty-and-staff/research-compliance/conflict-of-interest-and-outside-activities.html>

Students appointed as Graduate Assistants or Graduate Fellows/Awardees are still responsible for paying applicable student fees per semester credit hour. Students on financial appointments must be enrolled full-time each term, which is typically a 9/9/6 credit enrollment for Fall/Spring/Summer C, respectively; however, each appointment defines the credit enrollment requirements, which may exceed these numbers. ***Students should be aware of the specific requirements of their appointment and are ultimately responsible for ensuring correct enrollment per term.*** Students are financially liable for excess credits beyond their required registration (see appointment letter for details), unless arrangements are made in advance with their financial sponsor that they will cover the extra cost. If a student on appointment drops below the required registration at any time in the semester, the student automatically becomes financially liable for the entire registration cost, per UF financial rules.

1.6. Registration Requirements

Full-Time Registration is considered as 6-12 credits, depending on the term and appointment (see above). Students not on appointment may wish to enroll full time to finish their degrees in the minimum timeframe or may be required to enroll full time by external funding agencies or their academic units. See the BME Graduate Affairs Office or HR for information regarding FTE, required course hour enrollment, and other requirements associated with your appointment.

Students should register via Student Self Service (www.student.ufl.edu) by the published registration deadline. Record holds and late registration fees are always strictly enforced by the university. To review the anticipated schedule of courses for an upcoming semester, students should go to: <http://www.registrar.ufl.edu/soc/> For selected courses, registration is restricted (indicated by “DEPT” listed in the section column) and requires a completed *Semester Registration*

Form (see www.bme.ufl.edu under *student forms*). For enrollment in departmentally controlled courses offered in other departments (non-BME), students should contact the graduate advisor in that department. All required signatures must be complete *prior* to submission to the GAO. GAO will then register the student for these selected course(s). Students can request to review their Program of Study at any time by emailing grad@bme.ufl.edu, but they can easily track their course progress via student forms posted on our website. **Students are ultimately responsible** for ensuring they are on track to finish their degrees. *Note, if a student seeks to enroll in a course that is not in line with the curriculum requirement (e.g. a Specialized Elective outside the Colleges of Medicine or Engineering), they must file a petition and receive formal approval notification from the GPC prior to enrollment. Petitions filed after course enrollment are unlikely to be approved and the delayed request must be appropriately justified.*

During the term in which the student seeks to graduate, the student *must* be registered for **at least 3 credits** in fall or spring and **2 credits** in the summer that count towards that specific degree: For Master's Non-thesis students, this is met via course work that counts toward the graduate degree (note Doctoral Research Credits (e.g. BME 7979 and 7980) do not count towards an M.S. degree); Master's Thesis students must enroll in 6971; and Doctoral students must enroll in 7980. This minimum final term registration is applicable to all graduate students and the Graduate School will not accept petitions to this policy. Note that students receiving financial assistance may be required to register for more than this minimum number of credits and should see their letter of appointment for guidance.

Ph.D. students who complete all graduate degree requirements during a given semester, but narrowly miss the Final deadline specified by the Graduate School, may receive their degree in the following semester and avoid the minimum credit requirements (this is termed "Clearing Prior"). Please see the Graduate School catalog for specific information on Clearing Prior deadlines and terms and discuss potential options with the BME GAO.

1.7. Add/Drop

Courses may be dropped or added during the drop/add period without penalty; however, students on fellowships or assistantships must clear these changes with their advisor prior to modifications. This period typically lasts five UF calendar days, or two days for summer sessions, beginning with the first day of the semester (exact dates available on www.registrar.ufl.edu). Classes that meet for the first time after the drop/add period may be dropped without academic penalty or fee liability by the end of the next business day after the first meeting. Note, this does not apply to laboratory sections. After this period, a course may be dropped and a W will appear on the transcript. **Students are financially liable for the full cost (credit and fees) for any course added or dropped after the deadline.** This includes students with tuition waivers, as these waivers cannot be used for credit modifications after the drop/add window. Note, if a student on a graduate appointment drops credit(s) that reduce their course load below the enrollment requirements for their appointment, they will be held fully liable for the **entire cost of the courses** (credit and fees), not just the cost of the dropped credits. Further, their appointment will be automatically terminated, as full-time enrollment is a stipulation of most fellowship or assistantship appointments. Discuss the ramifications of course adjustments with the GAO, your advisor, and/or HR prior to modifying your course schedule.

1.7.1. Retaking Courses

Graduate students may repeat a course in which they earn failing grades (up to one time). Grade points from both the initial failed attempt and the first attempt earning a grade of C or better are

included in computing the grade point average. The student receives credit for the satisfactory attempt only.

1.8. Courses and Credits

Courses listed at 5000 and above are considered graduate courses and are limited to graduate students. Courses numbered 7000 and above are designed primarily for advanced graduate students.

Generally, graduate courses may not be repeated for credit; however, selected courses may be repeated. These courses are designed and typically subjected to a maximum number of credit hours, exceptions include courses numbered 6971, 7979, and 7980. No more than five credits each of 6910 (Supervised Research) and 6940 (Supervised Teaching) may be taken by a graduate student at the University of Florida. Course numbers 6971 (Masters Research), 7979 (Advanced Research), and 7980 (Doctoral Research) cannot count towards the Masters Non-Thesis degree.

It is crucial that BME students have an overall comprehensive understanding of the curriculum and be able to master it well. If a student lacks instruction in a particular area, the Associate Chair, Graduate Program Coordinator, Supervisor, or Graduate Advisor may suggest course(s) to enhance this student(s) education to the benefit of that student and his/her matriculation and experience through the Graduate Program in BME. For these select cases, an undergraduate course (at least 3000+) may be credited towards the graduate degree. This course, however, must be approved, via petition, *prior* to enrollment. If a student elects to enroll in an undergraduate course without approval, they may be fee liable for the course and it will *not* count towards their degree. Grades earned for undergraduate courses (up to the first 6 credits) will automatically count towards the student's overall GPA, regardless of whether it counts towards their degree or not, per UF Graduate School rules.

1.8.1. Professional Work

Graduate students may receive credit toward their degrees for courses in professional programs (e.g., D.V.M., or M.D.) when their advisors and graduate coordinators certify that the course work is appropriate for their programs and when the students receive permission from the academic units and colleges offering the courses. Restrictions and guidelines are governed by the UF Graduate School, see the UF Graduate Catalog Courses and Credits section for further details.

1.9. Grades

The only passing grades for graduate students are A, A-, B+, B, B-, C+, C, and S. ***An overall GPA of at least 3.0 must be maintained to remain in good academic standing*** (see section 1.12 for clarification on the impact of GPA in retention within the program). Grade points are not designated for S and U grades and are not used in calculating the grade point average; however, I (incomplete) grades will convert to a 0.0 credit if not changed within 1 semester. All letter graded courses taken as a graduate student are used in calculating the cumulative grade point average. Letter grades of C-, D+, D, D- or E are not considered passing at the graduate level, although the grade points associated with these letter grades are included in grade point average calculations.

1.10. Research

All students conducting research in a laboratory must be registered for research credits or paid as an OPS employee. All researchers must follow appropriate BME policies for laboratory access (see your Supervisory Chair for guidance). Per College of Engineering rules, all students

on non-paid appointments must register for research credits to fully account for graduate student involvement. PhD students, who are all matched to a doctoral advisor, should enroll in PhD research credits (BME 7979 or 7980, see Section 3.4.3) MS students can elect to enroll in research credits that apply towards their degree (see Section 2.4.2 for Thesis and 2.5.1 for Non-Thesis) or enroll in 0 credits of EGN 6913. Note that safety and RCR training is required *prior* to enrollment in research credit (see Section 1.10.1 and 1.10.2 for details).

1.10.1. Safety

The J Crayton Pruitt Family Department of Biomedical Engineering, in collaboration with the Herbert Wertheim College of Engineering, is committed to providing a safe and healthy working and learning environment for all of its students (<https://www.eng.ufl.edu/labsafety/>). Sustaining a culture of excellent laboratory safety starts with rigorous training. To facilitate appropriate training of safety concerns, ***all BME students are required to complete a BME laboratory checklist prior to gaining access to the laboratory.*** This checklist outlines required general safety training needed for general work in the building. Additional training will be needed, given the specific research conducted and risk encountered in your work. Guidance on the lab-specific training needed will be provided by your Supervisory Chair, as all Chairs are required to provide a safe working environment, ensure adequate safety training of their personnel, and maintain appropriate safety records for their own laboratory. Remember that most training modules have time limitations, so it must be updated. To further promote a culture of safety, our department has a BME Student Safety Council (SSC), which is comprised of graduate and undergraduate students, faculty, and the BME Departmental Laboratory Manager; an Engineering Safety Steering Committee serves at the college level. Students are strongly encouraged to join these councils. Any concerns regarding safety or training should be directed to your Supervisory Chair, the SSC, the COE Director of Laboratory Safety, or UF Environmental Health and Safety (<http://www.ehs.ufl.edu/>).

1.10.2. Responsible Conduct in Research (RCR)

Responsible conduct in research (RCR) is expected for all University of Florida students. Students conducting research will be expected to follow ethical standards when conducting research, from identification of potential conflicts of interest to responsible authorship and publication. To assist in supporting this endeavor, ***all students enrolled in research credits must complete the general RCR training*** (see <http://research.ufl.edu/faculty-and-staff/research-compliance/responsible-conduct-in-research-rcr-training/navigation-to-citi-for-rcr-responsible-conduct-of-research-training.html> for instructions on how to enroll). Further, students funded by NIH or NSF (or potentially other extramural funding agencies) must be provided with an additional RCR Training plan or enroll in a Responsible Conduct of Biomedical Research (see your Supervisory Chair for details).

1.11. Academic Honesty

All enrolled UF students have signed a statement of academic honesty upon enrollment, which commits the student to holding themselves, and their peers, accountable for maintaining the highest standard of honor (see <https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>). This standard is essential to maintain the integrity of the program and the field of biomedical engineering. Students are expected to work independently on coursework and program examinations, unless specifically authorized by the instructor or supervisor. It is always better to clarify permitted degrees of collaboration than to assume and be incorrect. Plagiarism of any form, from course assignments to doctoral dissertations, is a serious offense and will never be tolerated. Students are responsible for seeking and utilizing resources to understand the definition of

plagiarism

(e.g. <https://mediasite.video.ufl.edu/Mediasite/Play/adaa44500eaf460a84f238e6b9a558f9>; <http://usingsources.fas.harvard.edu/icb/icb.do?keyword=k70847&pageid=icb.page342057>; <https://owl.english.purdue.edu/owl/resource/589/01/>). Further, students can register for iThenticate or other plagiarism detection software to help screen their documents to avoid inadvertent plagiarism. Failure to comply with the honor code will result in disciplinary action that can span from grade penalties up to dismissal from the program.

1.12. Unsatisfactory Progress or Unsatisfactory Scholarship

Any graduate student may be denied further registration and subsequently dismissed from the program if progress toward completing their degree becomes unsatisfactory to BME, the College, or the Dean of the Graduate School. Unsatisfactory scholarship is defined as failure to maintain a B average (3.00) in all work attempted, unapproved delays in meeting critical academic milestones (e.g. taking their Qualifying examination), and/or cases of Honor Code violations (e.g. plagiarism, scientific misconduct). Regarding GPA issues, graduate students need to maintain an overall GPA of 3.00 truncated¹ and a 3.00 truncated GPA in their major (and in the minor, if a minor is declared). Students who drop below a GPA of 3.0 will immediately be placed on academic probation. Further, students with less than a 3.00 GPA may not hold an assistantship or fellowship (unless a 1 term petition is made) and cannot graduate. Failure to elevate their GPA above 3.0 after an additional term will result in dismissal from the program, unless a petition is submitted and approved by the Graduate Program Committee. Unapproved delays in meeting academic milestones, as defined by their specific degree, will also result in academic probation. Failure to resolve this delay within one term will result in dismissal from the program, unless a petition is submitted and approved by the Graduate Program Committee. Doctoral or Masters Thesis students on fellowship or assistantship support not making adequate research progress will, at minimum, be placed on probation, as documented in their semester Letter of Appointment. Students on probation may be terminated from their fellowship or assistantship appointment the following term, at the discretion of the Supervisory Chair. Lack of research progress is demonstrated via an unsatisfactory (U) grade earned in masters or doctoral research credits. Unsatisfactory research grades, while non punitive to their GPA, will be treated as unsatisfactory scholarship and result in immediate probation. Failure to make satisfactory progress in subsequent semesters may result in termination from the program. Dismissal is the decision of the Associate Chair of Graduate Programs and will be made in consultation with the student's Supervisory Committee and the Chair and Associate Chair of the department.

1.13. Petitions

The BME Guidelines outlines rules and regulations for the BME program that are governed at the departmental level. If a student seeks to deviate from any BME guideline, they should submit a formal petition to the BME GAO for a waiver, deferment, or alleviation of consequences associated with that deviation. It is always advisable to request this deviation *in advance* (prior to the deviation) to avoid consequences if the petition is denied. When filing this request, graduate students should consult with the BME Graduate Advisor regarding their academic needs or concerns, as well as to procure the appropriate forms for this formal petition. Depending on the nature of the petition, it will be approved by the GAO directly or sent to the GPC for full committee vote. Petitions must be formally approved prior to enforcement. Note that petitions are requests for deviations and must be appropriately justified. Examples of deviations that petitions are typically requested include: enrollment of courses outside the College of Engineering and College

¹ Truncated means that the GPA is not rounded-up, e.g. a 2.99 GPA would not be considered a 3.0

of Medicine (*in advance* of course enrollment); deferment in Qualifying Examination or Doctoral Committee timeline; substitution of Supervised Teaching requirements; and waivers of the BME Physiology course requirement.

As noted above, a student is also bound by the UF Graduate School guidelines. For deviations from UF Graduate School guidelines, petitions are more stringent and must be approved first by BME, then COE, and then the graduate school. Note that the Graduate School rarely permits guideline deviations and only under extraneous circumstances. Further, some guidelines (e.g. graduation GPA requirements and total credit hour requirements) are not petitionable. Seek advice from the BME graduate advisor regarding your particular circumstance.

1.14. Correspondence and Forms

Students must correspond and comply with outlined policies via electronic or hardcopy means. For electronic communications, all students are provided with a University of Florida email account (ufl.edu) upon entrance to the program. GAO will use this UF account for all official communications. *Students are responsible for promptly and thoroughly reading emails from these accounts and are expected to communicate in a professional manner.* For hardcopy correspondence, all documents, including forms, should be fully completed and submitted directly to the GAO office. **To minimize paperwork burden, the GAO encourages electronic submissions (email to grad@bme.ufl.edu) and accepts electronic signatures**, unless specifically stated otherwise. Most forms have clear deadlines and students are expected to comply with these deadlines.

1.15. Preparation for Final Semester

It is the student's responsibility to ascertain that all requirements have been met and that every deadline is observed. Deadline dates are set forth in the University Calendar and by the BME department. These dates can be found online at the Graduate School and BME websites.

Students must notify the BME GAO of graduation plans no later than the Graduate School registration deadline for their program. At the beginning of the final term, students must also file a degree application online through Student Self Service and must meet minimum registration requirements. Non-thesis Master's students must be registered for or have taken (in the preceding semester) BME 6907. Master's Thesis and PhD students should obtain the Checklist for their relevant degrees from the Graduate School website to ensure compliance with BME and Graduate School requirements: <http://graduateschool.ufl.edu/graduation/thesis-and-dissertation>.

For deadline information regarding submissions to the Graduate Editorial Office, please visit: <http://helpdesk.ufl.edu/application-support-center/graduate-editorial-office/> When the dissertation or thesis is ready to be put in final form, the following website offers formatting information: <https://asc.helpdesk.ufl.edu/>.

It is solely each student's responsibility to ensure that all required forms are submitted in accordance with Department and Graduate School deadlines.

1.16. Student Responsibility

The student is responsible for becoming informed and observing all program regulations and procedures. As outlined earlier, all graduate students are expected to follow *both* BME program and UF Graduate School guidelines. As this BME Guideline document is not intended to outline general UF Graduate School guidelines, every student must also review UF Graduate Catalog

general regulations and requirements and specific degree program requirements (see UF Graduate School website to access the graduate catalog for your year). **Rules are not waived for ignorance.** It is also the student's responsibility to check their UFL email on a regular basis. Failure to do so will not be a valid excuse for missing deadlines.

2. MASTER'S DEGREE

2.1. General

The Department of BME offers both a Masters of Engineering (M.E.) and a Masters of Science (M.S) degree. The M.S degree may be thesis or non-thesis. For all options, standard admission requirements of the Graduate School must be met. To be eligible for admission to the M.E. program, students must also have earned a bachelor's degree from an ABET-accredited college or they must complete articulation work for equivalence (see the GAO to review required documentation). Students who do not meet the ABET requirement may be admitted to the M.S. program.

The non-thesis Master's degree is a 30-credit course-work degree. A capstone project (BME 6907) must be included in the 30 credits. The Non-Thesis option requires 29 credits of course work and 1 credit of BME 6907.

The Thesis option requires 25 credits of course work and at least 5 credits of BME 6971 (depending upon the graduating semester). All Master's students (thesis and non-thesis) are required to pass a Final Examination.

2.2. BME M.E. or M.S. Degree Requirements

The general minimum requirements for completion of the BME M.E. and M.S. programs are:

- Completion of course requirements outlined in the Program of Study
- Good academic standing with an overall GPA of 3.00 truncated and a 3.00 truncated GPA in their major (and in the minor, if a minor is declared) at graduation
- Assignment of Supervisory Chair (and Committee if Thesis)
- Completion of Final Examination (Capstone or Thesis)

2.3. Course Requirements

The required courses for the Master's programs are summarized in Sections 2.7 and 2.8. Unless otherwise specified, for any Master's degree, the student must earn a minimum of 30 credits as a graduate student at the University of Florida. Graduate credit is awarded for courses numbered 5000 and above (unless approved 3000-4999 level courses, for up to 6 credits) and at least 15 credits must be in BME (excluding BME 6971). All work, including transferred credit, counted toward the master's degree must be completed during the seven years immediately preceding the date on which the degree is awarded.

2.3.1. Transfer of Credit

If appropriate, a Transfer Petition request may be submitted to the BME GAO to request a transfer of credits to apply towards the BME Master's degree. Only graduate-level (5000 and above) coursework, earned with a grade of B or better, are eligible to be transferred. S/U coursework is **not eligible** for transfer of credit. Transferred credit can include no more than 9 credits from outside institution/s approved by UF and up to 6 credits from postbaccalaureate work at the University of Florida, for a maximum of 15 transfer credits allowed. To apply towards the Master's degree, all transferred courses must be designated within course classifications (as outlined in **Course Transfer Request Form**, see GAO for form) and be submitted to the Graduate Program Committee (GPC) for

approval. If approved, the petition is then submitted to the Graduate School. These credits are applied only after written approval from the Dean of the Graduate School, which is not automatic.

2.4. Master's Thesis Option

In addition to the required outlined coursework, all candidates for the Master's degree with thesis must conduct an independent research investigation that results in a Master's thesis. This thesis must demonstrate independent work that meets the standards outlined by their Supervisory Committee, the BME department, and the UF Graduate School. The written thesis must be presented and defended orally to the student's Supervisory Committee. The candidate should consult the Graduate School Editorial Office for instructions concerning the written format of the thesis. The University Calendar explicitly specifies final dates for submitting the original thesis to the Graduate School, so students should refer to this calendar to ensure they meet deadlines to graduate on schedule. ***These deadlines are not controlled by BME and are universally binding.*** Note that Master's theses ***must*** be defended prior to the "First Submission" to the Editorial Office (this is different from doctoral dissertations and typically within the first 8 weeks of the semester).

2.4.1. Supervisory Chair and Committee

For a Master's degree with a thesis, a Supervisory Chair and Committee are required. The Supervisory Committee must consist of at least two members selected from the Graduate Faculty. The Chair **must** be a member of the BME Graduate Faculty. The Chair will serve as the student's advisor. Candidates should appoint their Supervisory Chair and/or Committee as soon as possible after admission to the Graduate School, but **no later than the end of the second term enrolled in the program**. Students should complete a *Master's Thesis Supervisory Committee Election* form (see GAO or website for form), signed by their full committee, to finalize their selection.

The supervisory committee's duties are to advise the student, to check on the student's qualifications and progress, to supervise the preparation of the thesis, and to conduct the final exam.

2.4.2. Research and Course Credit

Students are expected to conduct independent research for their thesis as early into the program as possible, under the guidance of their Committee Chair and with input from their Supervisory Committee. Thesis students are required to enroll in and satisfactorily complete 5 total credits of BME 6971, which serve to credit their research efforts. Credit allocation can be flexible throughout the student's tenure in the program, with two stipulations: 1) students must enroll in BME 6971 for at least 2 terms; and 2) ***it is required that the student enrolls in 2-3 credits of BME 6971 in their final term, dependent upon the semester of graduation*** (i.e., 2 is required for the Summer term and 3 is for the Fall or Spring terms). The number of credits enrolled should be proportional to the amount of time students are expected to devote to the research project during that semester and all research credit must be approved, supervised, and graded by the student's designated Supervisory Chair. To enroll in BME 6971 credits, students must complete a *Master's Semester Registration Form* (see website), signed by their Supervisory Chair that outlines the number of credits of BME 6971 enrolled for that term.

2.4.3. Final Examination (Thesis Defense) Procedures

The Final Examination for a Thesis Master's degree is submission and successful defense of a written thesis. The goal is to present a thesis that shows independent investigation, is of publishable quality, in a form suitable for publication, and satisfies the expectations outlined by

the student's Supervisory Committee. Each student should work closely with their Supervisory Committee in preparing the written and oral components of this examination.

2.4.4. Final Examination Timing

M.S. Thesis students can take their Final Examination no earlier than the semester preceding their anticipated graduation. The student should let the GAO know of their graduation intentions the semester prior to graduation. Non-compliance with this requirement may delay graduation if the student has not met all degree requirements.

The student is expected to be in charge of scheduling of their examination in coordination with both their Supervisory Committee and the GAO. Note that the UF Graduate School has deadlines for defense dates, so these should be reviewed prior to scheduling the oral examination. The student must submit a fully completed *MS Thesis Oral Defense Announcement* form (see website for form) to the GAO at least 1 month in advance of the tentative exam date to coordinating exam logistics (e.g. room reservations) and required paperwork. A public announcement will then be generated using this information and circulated. Finally, the student should come to the GAO to pick up required forms (Examination Rubric and MS Thesis Signature Forms) for the thesis defense at least 1 week in advance. Graduation may be delayed for those who do not adhere to these rules.

The written portion of the thesis must be submitted to the Supervisory Committee two weeks prior to the scheduled oral examination. Electronic format is permitted, but paper format must be provided if requested.

Again, note that the deadlines required by the Graduate School for submission of the written portion of the thesis are posted on the UF Academic Calendar and should be reviewed to ensure timely submission of all required documents. *It is solely each student's responsibility to ensure that all required forms and documents are submitted in accordance with Department and Graduate School deadlines.*

2.4.5. Thesis Format

The final examination consists of both written and oral components. The written thesis should be of publishable quality and in a form suitable for publication. The style and content should be succinct and clear. The final format for the document is guided by the Graduate School requirements (see <http://helpdesk.ufl.edu/application-support-center/graduate-editorial-office/format-requirements> for deadlines, format requirements, and example pages; <https://asc.helpdesk.ufl.edu/> for the Application Support Center/ Electronic Theses and Dissertation Lab; and <http://graduateschool.ufl.edu/graduation/thesis-and-dissertation> for Graduate School Editorial Office Information) and the Supervisory Committee, but the minimum recommended standards are:

- **Abstract** – abstract should be ~ 200 words
- **Introduction/Background/Significance** – to provide context for the central hypothesis and ensure that the work outlined is independent and of relevance
- **Central Hypothesis/Objective and Specific Aims**– hypotheses or objectives should be written in the correct form and aims should seek to rigorously test these hypotheses or objectives
- **Materials and Methods** – summary of materials and methods performed following the style of standard journals in the field

- **Results** – summarizing results collected with figures/tables in publication quality format
- **Discussion** – discussion of interpretation and impact of results collected, as well as potential challenges and pitfalls of the work, as well as alternatives
- **Literature Cited** - list references using a standard citation format that also includes all authors and the full title of the cited reference (use of citation software *strongly* encouraged)

The oral defense is expected to provide an appropriate summary of the thesis. A handout containing the slides is suggested to facilitate discussion. This formal presentation is public, should be 30-45 min long and cover the key aspects of the thesis work, including the key topics outlined in the written thesis. Following the formal open presentation, a dedicated question and answer session is expected, wherein the first section is for the general audience and the second session is closed to only the Supervisory Committee and the student. Students are expected to address questions directly and to demonstrate their capacity to rigorously defend all aspects of their research. Further, the Supervisory Committee is free to ask additional questions on general BME and selected minor subjects, as well as matters pertaining to the student's field of study.

The entire Supervisory Committee is required to participate in the final examination in compliance with Graduate Council policies. Further, the Chair or co-Chair must be in the same physical location as the student and the other members are permitted to participate from remote sites via technological means (Graduate School Policy).

2.4.6. Examination Results

Following completion of the examination, the student will be asked to leave the room and the Supervisory Committee may then engage in discussion regarding the student's exam performance. The student should leave their MS defense paperwork, which includes the *Master's Thesis Final Examination Results*, the *Master's Thesis Final Examination Rubric*, and the *Thesis Approval Signature* forms (GAO provides these forms to the student when they collect their MS defense paperwork).

Following completion of the discussion, the committee will make collective PASS / FAIL recommendation. The recommendation must be unanimous and take place at the conclusion of the examination prior to the committee's adjournment. The final vote is binding and recorded in the *Master's Thesis Final Examination Results* form. At that time, the Supervisory Committee will complete the *Master's Thesis Final Examination Rubric*, which is based on both the written and oral components of the examination. Appropriate and detailed comments for each section should be provided, with the Committee Chair serving to condense all comments in the *Master's Thesis Final Examination* form. Comments should be tailored to provide constructive and specific feedback of identified weaknesses or deficiencies (if any).

If PASS, all committee members must sign the *Master's Thesis Final Examination Results* form. In addition, they should sign the *Thesis Approval signature page*².

If FAIL, the committee members should specifically document the deficiencies the student must address prior to reexamination, record the decision, and still sign both the *Master's Thesis Final Examination Report* and *Thesis Approval signature page* (with the "Fail" decision checked).

² In cases where the thesis committee has identified issues with the written report that the student must address prior to final approval, the committee must specifically outline these outstanding issues and may elect to not sign the Thesis Approval signature page at the time of the oral examination. In this case, the student is responsible for collecting all signatures once the issues have been addressed.

2.4.7. Reports and Records of Examination:

The Committee Chair is responsible for submitting the formal examination rubric and Final Examination Report with recommendation (PASS or FAIL) to the GAO **on the day of the examination**. The GAO will then certify the report and recommendation, and upload this into the graduate management database (which the student can review at (<http://gradschool.ufl.edu/gimsportal/gatorlink/portal.asp>)). Examination rubric forms will be available to the student upon request.

2.4.8. Reexamination

Only one reexamination is permitted and should be scheduled as soon as possible, depending on the recommendations and conditions outlined in the FAIL vote. This is typically within 2-3 months and must be no later than 6 months after the original examination. If a second FAIL is given, the student will be dismissed from the program due to lack of academic progress.

2.5. Master's Non-Thesis Option

In addition to the required outlined coursework, all non-thesis Master's degree candidates must successfully complete a Final Comprehensive Examination, herein termed the Capstone Project. The Capstone Project is summarized in a Final Comprehensive Written Report, which is graded by the designated Supervisory Chair and credited via enrollment in BME 6907 (1 credit). Students have the flexibility to select from 4 different options to fulfill this requirement, as outlined in Section 2.5.1.

2.5.1. Capstone Project Options

Students enrolled in the Master's Non-Thesis program must select a Capstone Project Option ***by no later than the end of their second enrolled term***. Election of the Capstone Project Option is made at the same time as designation of the Supervisory Chair (see Section 2.5.4 for Chair selection and website or GAO for *Masters Non-Thesis Supervisory Chair and Capstone Election* form) Capstone Projects options are: an Academic Research Project; a Clinical Immersion Project; an Internship Project; or a BME Report, as outlined below.

2.5.1.1. Academic Research Project

Students electing this option will conduct academic research within a laboratory at UF in a manner that results in a complete Capstone Project, as summarized by a Final Comprehensive Written Report. Students must first identify a Supervisory Chair willing to supervise their research project, review the Final Comprehensive Written Report, and assign a final grade for BME 6907 (1 credit). Students electing this option may also enroll in additional credits of BME 6905 (up to 6) during their research experience, which can be applied towards their BME Elective or Specialization Elective course requirement, as outlined in Section 2.8.

2.5.1.2. Clinical Immersion Project

Students electing this option will conduct clinically-focused research with a supervisor at UF in a manner that results in a complete Capstone Project, as summarized by a Final Comprehensive Written Report. Students must identify a Supervisory Chair willing to supervise their performance in the Clinical Immersion project, review the Final Comprehensive Written Report, and assign a final grade for BME 6907 (1 credit). Clinical Immersion supervisors and projects can be identified via enrollment and successful completion of the Clinical Immersion course (1 credit), however, this is not a requirement. Note that

material used to meet course requirements for the Clinical Immersion course cannot be applied towards those outlined for the Capstone Project, as these are separate courses. Students electing this option may also enroll in additional credits of BME 6905 (up to 6) during their research experience, which can be applied towards their BME Elective or Specialization Elective course requirement, as outlined in Section 2.8.

2.5.1.3. Internship Project

Students electing this option will conduct an internship (typically 2-3 months) with a sponsoring company or US government laboratory outside of UF in a manner that results in a complete Capstone Project, as summarized by a Final Comprehensive Written Report. Identification of prospective internships is driven by the student, although contact companies and potential opportunities are periodically posted on the BME website (<http://www.bme.ufl.edu/industry/bme-interns>) or at BME Career Fairs. For internships, students must also identify a UF faculty member that will serve as the official Supervisory Chair. This Chair will coordinate with the internship supervisor and student to assess performance, review the Final Comprehensive Written Report, and assign a final grade for BME 6907 (1 credit). Students electing this option may also enroll in up to 6 credits of BME 6905, which can be applied towards their BME Elective or Specialization Elective course requirement, as outlined in Section 2.8. While a degree of confidentiality is typically required when working with an external agency (e.g. intellectual property, trade secrets), a final report is still required for the work conducted. As such, students should work with their internship supervisors (both their Supervisory Chair and their agency supervisor) to outline a disclosure plan that permits fulfillment of the written report (as outlined in Section 2.5.6). For additional information regarding BME internships and required forms and procedures, see the GAO or website.

2.5.1.4. BME Report

Students who do not conduct research or an internship must submit a BME Report, which is a robust literature review that summarizes and critiques a specific research topic within the field of biomedical engineering. This BME Report serves as the Final Comprehensive Written Report. The format for the report is outlined in Section 2.5.6. Students that select this option must identify a Supervisory Chair willing to provide topic guidance and to review and grade the final BME report. The BME Report can *only* be used to satisfy the 1 credit requirement of BME 6907.

2.5.2. Credit Enrollment and Allocation for Capstone Project

All non-thesis Master's degree candidates must enroll in and satisfactorily earn 1 credit of BME 6907, which serves to validate successful completion of the Master's Non-Thesis Final Examination. ***BME 6907 can be taken no earlier than the semester preceding their final graduating term.*** This enrollment is required for all Master's Non-Thesis students, regardless of their capstone project election. To enroll in BME 6907, students must submit a completed and signed BME 6907 Enrollment Form (see the *NonThesis MS/ME Final Comprehensive Examination* form on website). This page serves as a written agreement between the Supervisory Chair and the student for the requirements that must be met to complete the Final Capstone Project and earn an "S" in BME 6907. The Certificate of Completion form (see the *NonThesis MS/ME Final Comprehensive Examination* form on website) must be completed and signed when the project is complete (see Section 2.5.7)

In addition, students electing research or internship options may also enroll in up to 6 credits of BME 6905 (Individual Work). ***Students electing the BME Report option will only earn the credit for BME 6907 (1 credit)***. Elected credit is proportional to the amount of time students are expected to devote to the project and all research credit must be approved, supervised, and graded by the student's designated Supervisory Chair (use the *MS Semester Enrollment* form on website to enroll in these credits). As a guideline, 1 credit of work on a project typically correlates to ~5 h per week (e.g. a 3 credit enrollment would translate to 15 h of work per week). The exact expectations and time commitments may be more and is at the discretion of the Supervisory Chair, so students should seek to define this prior to enrollment in credit hours.

2.5.3. Scope of Work for Capstone Project

For research or internship elections, work designated to meet Capstone Project requirements is expected to apply graduate-level biomedical engineering knowledge towards a designated project. Examples of unacceptable research or internship duties include undergraduate-level work, data entry, administrative work, and maintenance. For the BME Project election, graduate-level analysis, scope, and critiques must be applied towards the selected topic.

2.5.4. Supervisory Chair Selection

All Master's Non-Thesis degree candidates must designate a Supervisory Chair. The Supervisory Chair should be a member of the BME Graduate Faculty. If the potential supervisor does not have this assignment, a co-Chair with this status (with aligned research interests) must also be appointed. The minimum requirements of the Supervisory Chair will be to sign the *NonThesis MS/ME Final Comprehensive Examination* forms and assign a final grade for BME 6907. For students that elect Academic Research, Clinical Immersion, or Internship, Supervisory Chairs may serve to also grade additional research credits (BME 6905). Students should work with their Supervisory Chair to clearly outline expectations of work product prior to enrollment in BME 6907 and additional elective credits. Students must complete a *Masters Non-Thesis Supervisory Chair and Capstone Election* (see GAO or website for form), signed by the Supervisory Chair, to finalize their selection of supervisor and capstone project option. ***This must be completed by no later than end of the second enrolled term.***

2.5.5. Final Examination Written Report Procedures

As outlined above, the Final Examination Written Report serves as a written summary of the Capstone Project, which is required for all non-thesis Master's projects. When desiring credit for the Final Examination, students must enroll in 1 credit of BME 6907. The report varies, depending on the Capstone Project option selected and the discretion of the Supervisory Chair. As such, it is essential that the student meets with the Supervisory Chair *prior to enrollment* in BME 6907 or optional research/internship credits to explicitly outline the requirements that must be met for satisfactory level work. This criteria must then be written out and signed using the *BME 6907 Enrollment Form* page of the *NonThesis MS/ME Final Comprehensive Examination* form (see website). The report must meet the minimum format guidelines, outlined in Section 2.5.6.

2.5.6. Final Examination Written Report Format

The Final Examination Written Report should provide a robust summary of the Capstone Project conducted. The content should be complete and the writing should be succinct, clear, and scientific. The final format for the document is ultimately guided by the Supervisory Chair; however, the minimum requirements are outlined below

For Academic or Clinical Immersion Research or Internship Capstone Projects, the minimum recommended standards are:

- **Total Content** – 12-15 pages (single-spaced, typed, 10 point font, Times New Roman)
- **Title**
- **Abstract** – abstract should be ~ 200 words
- **Introduction/Background/Significance** – to provide context and relevance for the work conducted
- **Objective or Hypothesis** – the hypotheses or objectives of the work should be written in the correct form and aims should seek to validate/test these hypotheses or objectives
- **Materials and Methods or Approach** – summary of materials and methods performed following the style of standard journals in the field
- **Results** – summarizing results collected with figures/tables in a quality format
- **Discussion** – discussion of interpretation and impact of results collected, as well as potential challenges and pitfalls of the work, as well as alternatives
- **Literature Cited** - list references using a standard citation format that also includes all authors and the full title of the cited reference (use of citation software, e.g. EndNote, is *strongly* encouraged)

For the BME Report option, students should follow the format for a robust literature review article. The length should be 10-15 pages (single-spaced, typed, 10 point font, Times New Roman). The review should be focused on a particular facet of BME and contain extensive references with a focus on recent literature (i.e. most citations < 5 years). The report should contain subheadings to outline topics within the global area studied. Topic subheadings should robustly summarize, interpret, and critically analyze findings from published literature. The final section should provide an overall summary of the topic with appropriate recommendations for future research. All references should be appropriately cited using a format designated by the Supervisory Chair. The use of citation software (e.g., EndNote) is strongly encouraged.

Note that all Final Examination Reports will be electronically screened via plagiarism software to identify any violations. Any violations to the Student Honor Code will be reported.

2.5.7. Final Examination Report Submission

The Final Examination Written Report must be submitted to the Supervisory Chair for review and revised per Supervisory Chair feedback (if requested). Once final, the Supervisory Chair should grade the Final Examination Report by completing the *Certification of Completion* page of the *NonThesis MS/ME Final Comprehensive Examination* form (the student provides this; see website for form). As outlined on the form, both the student and Supervisory Chair's signature are required for processing. This form must then be submitted to the GAO. The GAO will certify the final results and completion of the Final Examination will be noted in the Graduate Information Management System (GIMS), if applicable.

2.5.8. Final Examination Report Timing

The successful completion of the Final Examination must be updated into GIMS by the deadline defined by the UF Graduate School, which is posted on the UF Academic Calendar for each semester. *Note that this deadline is typically several weeks prior to the end of classes for that semester. Further, the BME GAO will posted earlier deadlines to ensure timely processing and uploading of forms to the website.* Students must adhere to these deadlines or risk delayed graduation. It is solely each student's responsibility to ensure that their Final Examination Report is submitted to their Supervisory Chair with sufficient lead-time to permit review, feedback,

modification, assignment of final grade, submission of Final Examination Report Form, and uploading of this form by the GAO.

2.5.9. Final Examination Report Retakes

If the student receives an I or U grade for BME 6907 (i.e. incompletes or fails the Final Examination), he/she must make up this work or retake BME 6907 within two semesters. The Final Examination may be retaken only once. If a second U grade is awarded for BME 6907, the student will be dismissed from the program due to lack of academic progress.

2.6. Transfers to Ph.D. Program

If a student in the general Master's program applies to the PhD program and is accepted, the student may elect to take the Graduate Doctoral Qualifying Examination (Section 3.6.3) and, upon successful completion, satisfy the Master's Non-Thesis Final Exam and the Graduate Doctoral Qualifying Examination simultaneously. It is solely each student's responsibility to ensure that all required forms are submitted in accordance with Department and Graduate School deadlines. See the GAO for more details.

2.7 BME MASTER'S THESIS GRADUATE PROGRAM PLAN

BME Core Requirements (10 credits total):

Course			Semester completed	Grade earned
BME5401	Biomedical Engineering & Physiology ^a	3		
BME6018	Clinical Correlations	3		
BME6936	BME Seminar (Fall or Spring) ^b	1		
	BME Mathematics Requirement	3		

^aBME5401 may be waived if student provides documentation of taking at least 3 credits of physiology at a graduate or undergraduate level with a grade of B or better. This 3 credit is then replaced with an alternative BME course.

^bAn additional semester of BME 6936 may be taken (up to 1 additional credit), to be counted in the Specialization Electives allocation.

^cSee Course listings at www.bme.ufl.edu/academics/course_listings/graduate for designated BME Math courses that meet this requirement

BME Electives (6 credits total)^d:

Course			Semester completed	Grade earned

^dAny graduate-level BME-prefix course (excluding any S/U graded course).

Specialization Electives (9 credits)^e:

Course			Semester completed	Grade earned

^eAny graduate-level course in the College of Engineering or College of Medicine (can include BME courses). Excludes any S/U graded courses, except BME 6936 (1 credit only)

Thesis Credits (5 credits total)

Course			Semester completed	Grade earned
BME 6971	Master's Thesis			
BME 6971	Master's Thesis (graduating term) ^f			

^fThe Graduate School requires MS Thesis students to enroll in BME 6971 during their final graduating term. This must be at least 3 credits for Fall/Spring or 2 credits for Summer.

TOTAL CREDITS REQUIRED: 30

2.8 BME MASTER'S NON-THESIS GRADUATE PROGRAM PLAN

BME Core Requirements (10 credits total):

Course			Semester completed	Grade earned
BME5401	Biomedical Engineering & Physiology ^a	3		
BME6018	Clinical Correlations	3		
BME6936	BME Seminar (Fall or Spring) ^b	1		
	BME Mathematics Requirement	3		

^aBME5401 may be waived if student provides documentation of taking at least 3 credits of physiology at a graduate or undergraduate level with a grade of B or better. This 3 credit is then replaced with an alternative BME course.

^bAn additional semester of BME 6936 may be taken (up to 1 additional credit), to be counted in the Specialization Electives allocation.

^cSee Course listings at www.bme.ufl.edu/academics/course_listings/graduate for designated BME Math courses that meet this requirement

BME Electives (6 credits total)^d:

Course			Semester completed	Grade earned

^dAny graduate-level BME-prefix course (excluding any S/U graded course).

Specialization Electives (13 credits)^e:

Course			Semester completed	Grade earned

^eAny graduate-level course in the College of Engineering or College of Medicine (can include BME courses). Excludes any S/U graded courses, except BME 6936 (1 credit only)

Non-thesis Credits (1 credit)^f

Course			Semester completed	Grade earned
BME 6907	Master's Non-Thesis Project	1		

^fMS non-thesis students are *required* to register for 1 credit of BME6907 Non-thesis project to fulfill their Final Examination Requirement no earlier than the semester proceeding their final term.

TOTAL CREDITS REQUIRED: 30^g

^gNote that no more than 6 credits of the total 30 credit can be from S/U courses.

3. DOCTOR OF PHILOSOPHY DEGREE

The University of Florida Biomedical Engineering Ph.D Program seeks to provide students with a fundamental understanding of the application of engineering principles to biomedical research in a highly translational manner. The goal of this program is to graduate independent, creative, and innovative global ambassadors to the field of biomedical engineering.

3.1. Degree Timeline and Deadlines

The recommended deadlines* for Ph.D. students are:

Time from Start of Program	Milestone	Section
Within 1 st semester	Submit selection of Research Area	3.3
Within 1 st semester	Selection of a Doctoral Advisor	3.5
End of 2 nd semester	Pass Departmental Comprehensive Examination	3.6.2
End of 2 nd year ¹	Finalization of Ph.D. Supervisory Committee	3.6.1
Within 2.5 years ¹	Pass Graduate Qualifying Examination	3.6.3
Within 2.5 years ¹	Admission to Ph.D. Candidacy	3.6
2.0+ Annually	Annual Research Update with Supervisory Committee	3.4.4 & 3.6.1.3
No earlier than 6 months prior to defense	Sufficiency Meeting with Supervisory Committee – <i>Recommendation Only</i>	3.7.1
4.0-5.0	Thesis Defense	3.7

**Academic holds, probation, or dismissal from the program may occur if a student is out of compliance with recommended deadlines and milestones, see Section 1.12.*

¹Students may petition for extension on these deadlines with support from their doctoral advisor

3.2. BME Ph.D. Requirements

The general minimum requirements for completion of the BME Ph.D. program are:

- A minimum of 90 total credits
- Completion of all required courses (or equivalent subject coverage) with appropriate GPA (minimum 3.0)
- Additional coursework as specified by the Supervisory Committee
- Completion of Supervised Teaching requirement (4 total credit hours)
- Complete requirements for admission to Ph.D. Candidacy
- Research credits (BME7979 before candidacy; BME7980 after candidacy)
- Demonstration of scholarly dissemination of scientific contributions through peer reviewed publication(s)
- Successful Ph.D. Dissertation Defense

3.3. Research Area

All Ph.D. students are required to select a Research Area, which follows their specific research interests within the field of BME. This Research Area should assist in guiding advisor and coursework selection. While many projects may cross into several research areas, students should pick one area in which they feel they are more closely aligned. Student are expected to elect their Research Area during election of their Doctoral Advisor (see Section 3.5 and *Doctoral Chair & Research Area Election* form on website). This designation will also dictate the faculty composition for the student's Departmental Qualifying Examination. While this designation is

commonly retained throughout the student's tenure, students may elect to change their research area if their research focus is modified due to faculty assignment, project focus change, etc. A sound reason must be provided for this change and this change can be made using the same form.

The Department of Biomedical Engineering Research Areas are:

- Biomaterials & Regenerative Medicine
- Biomechanics & Bionics
- Biomedical Imaging & Applications
- Molecular & Cellular Engineering
- Modeling & Biomedical Data Science
- Neural Engineering

3.4. Course Information

3.4.1. Course Requirements

All students must complete the minimum course requirements for doctoral degrees, as outlined in Section 3.8. Electives provide flexibility to the student to tailor their coursework to support their research. A minimum of 90 credits beyond the bachelor's degree is required for the Ph.D. degree in all fields. All master's degree coursework counted towards this degree must have been earned in the last seven years.

3.4.2. Transfer of Credit

See the Graduate Catalog for transfer of credit policy. Students should promptly contact the GAO following admission to the program to begin the process of transferring credits from a previous degree and/or institution. To apply towards the Doctoral degree, all transferred courses must be designated within course classifications (as outlined in *Course Transfer Request Form*, see GAO for form) and be submitted to the Graduate Program Committee (GPC) for approval. This petition cannot be submitted until final transcripts have been received in the Office of Admissions. If approved, the petition is then submitted to the Graduate School. These credits are applied only after written approval from the Dean of the Graduate School, which is not automatic. All such transfer requests must be made by petition of the BME academic committee no later than the third semester of Ph.D. study.

3.4.3. Registration in Research Courses

Advanced Research (7979) is open to doctoral students who have not yet been admitted into Ph.D. Candidacy. Research for Doctoral Dissertation (7980) is reserved for doctoral students who have been admitted to candidacy. Students enrolled in 7979 during the term they qualify for candidacy will stay in this registration unless the GAO elects to change their enrollment to Research for Doctoral Dissertation (7980) or via petition by the student to the GPC.

3.4.4. Supervised Teaching Requirement

All doctoral students must satisfactorily complete a total of 4 credits of Supervised Teaching (BME 6940). The primary objective of Supervised Teaching is to expose the participant to the practice of instruction at a college-level. As a secondary objective, Supervised Teachers (STs) improve the educational experience of students enrolled in the course. As such, doctoral students enrolled in BME 6940 will gain experience in direct contact with students, such as delivering lectures, holding office hours and recitation sessions, supervising students in laboratory courses, etc.

Students will be selected for enrollment in BME 6940 starting in their second year. Typically, students are assigned for 1 term in their second year and the 2nd term in their 3rd year. Course

assignments are made by the GAO and take into account course enrollment, instructor needs, and doctoral student's preference. Assignments are typically finalized 1 month prior to their enrolled term. Students should complete their Supervised Teaching requirements by the end of their third year in the doctoral program. Enrollment of students in their first year is discouraged, unless the student is transitioning from the MS program, and must be first approved by their Doctoral Advisor and the GAO (see office to discuss options). Petitions to delay enrollment must be petitioned with justification, supported by the Doctoral Advisor, and approved by the BME Chair of Graduate Programs. Further details on expectations and required training is provided in the syllabus for BME 6940.

3.4.5. Evaluation for Ph.D. Students

The Supervisory Committee Chair, in consultation with the other committee members, must give each PhD student a written evaluation of his/her progress towards his/her degree *at least once a year*. All PhD students appointed in the BME department via fellowship or assistantship will be evaluated every semester via a Letter of Appointment. This evaluation will, at minimum, serve to designate if the student is making adequate progress towards their degree. The student is given an opportunity to discuss this evaluation with his/her Supervisory Committee Chair and both the supervisor and the student must sign the formal evaluation. These evaluations will be placed on file with HR and/or the GAO, depending on the appointment. Students not making sufficient progress may be denied registration or dismissed from the program, as outlined in Section 1.12.

3.5. Selection of Ph.D. Advisor

Upon acceptance into the Ph.D. program, students are expected to identify a Doctoral Advisor. This advisor will serve as their primary mentor for their dissertation research and as the Chair of their Supervisory Committee. The Doctoral Advisor *must* have Graduate Faculty status within the Department of Biomedical Engineering. If the desired research advisor is *not* a member of the BME Graduate Faculty (but is a member of the UF Graduate Faculty), they can only serve as the Co-Chair of the student and a faculty who is a member of *Primary* BME Graduate Faculty must be named as the Chair of the student's committee. This named Chair will formally serve as the student's Doctoral Advisor.

Selection of a Doctoral Advisor is encouraged as early into the Ph.D. program as possible to enhance efficiency of progress through the program; however, students are strongly encouraged to meet with multiple faculty within their research area of interest to ensure a strong advisor-advisee match. The selection of a Doctoral Advisor is an important decision, thus both the advisor and advisee should enter into this agreement in a judicious manner. Both the student and the advisor should consider research goals, mutual interests, compatibility of work habits and personalities, and the student's career goals when making this decision.

Depending on the appointment of the graduate student, Graduate Assistant, Graduate Fellow, or Graduate Student Fellow, the timing of the advisor-advisee match may vary. In general, most PhD students entering the department supported by Graduate Assistantships will be matched to a Doctoral Advisor immediately upon appointment, as the Doctoral Advisor is providing the full funding for the student's assistantship. This match will be clearly outlined in the student's funding offer letter.

For students appointed as Graduate Student Fellows (e.g. Graduate Student Preeminence Award Fellows) or Graduate Fellows (i.e. funded by extramural fellowships), the matching process occurs during the 1st semester, typically within the first 6-8 weeks (the exact deadline is provided at

Orientation). To match students to advisors, both students and potential advisors will be asked to provide a ranked list of their preferred Doctoral Advisors or advisees, respectively (via *Doctoral Chair Ranked List* form). The Graduate Program Committee will then use these lists to formally match up students with advisors. The matching process uses the following criteria: student preference, faculty preference, faculty appointment (Primary BME faculty have top priority), faculty funding, and current distribution of students among advisors.

To formalize matching of a doctoral student to a Doctoral Advisor, the student must submit the *Doctoral Chair & Research Area Election* form (see website). ***This should be done immediately following advisor matching.***

If a student cannot be matched with a Doctoral Advisor within the 1st semester, the student will be closely monitored to facilitate matching during the 2nd semester of study. If an advisor-student match cannot be made by the 2nd semester, the student must then elect to transfer to the MS program or leave the program.

3.6. Ph.D. Candidacy

The general minimum requirements for Admission to Ph.D. Candidacy are:

- Appointment of Ph.D. Supervisory Committee Members
- Successful Pass of Departmental Comprehensive Examination
- Successful Pass of Graduate Qualifying Examination
- Good academic standing (e.g. maintenance of minimum GPA)

3.6.1. Appointment of Ph.D. Supervisory Committee

The Ph.D. Supervisory Committee provides guidance on the student's research project and academic progress throughout the student's graduate tenure. The student should personally meet with potential faculty candidates for their Supervisory Committee to clarify the roles and responsibilities of these members (see below for details) and to begin establishing a relationship with the faculty members. Students are encouraged to set up their Supervisory Committees as soon as their research project is defined, but no later than the end of their 2nd year of study.

3.6.1.1. Membership

Supervisory Committees are designated by the student and faculty advisor. The Supervisory Committee for a candidate for the doctoral degree shall consist of ***no fewer than 4 members.*** All faculty must be members of the UF Graduate Faculty to be eligible. Additional requirements regarding the make-up of the committee are:

1. at least 2 members, including the chair, must be from the *BME Graduate Faculty*, whereby at least 1 of these is a *Primary* BME Faculty member.
2. at least 1 member from a different educational discipline, *unaffiliated* with the Department of BME (designed as the External Member)

It is *strongly suggested* that 1 member of the committee be from the College of Medicine or other health-related college. The dean of the Graduate School is an ex-officio member of all Supervisory Committees (but does not count towards the member total).

Once the committee has been selected, all committee members must sign the *Doctoral Supervisory Committee* form (see website for form). This completed form must be certified by the GAO. Modifications in the committee make-up must be recorded via submission of *Doctoral Supervisory Committee Modification* form (see website for form).

3.6.1.2. Duties and Responsibilities

Duties of the Supervisory Committee are as follows:

1. To inform the student of all regulations governing the degree sought. It should be noted, however, that this does not absolve the student from the responsibility of informing himself/herself concerning these regulations.
2. To conduct the Graduate Qualifying Examination and to discuss and approve the proposed dissertation project and the plans for carrying it out. The entire Supervisory Committee must participate in the oral portion of the examination in compliance with Graduate Council policies, whereby the Chair or co-Chair must be physically present and the other members are permitted to participate from remote sites via technological means. This examination must be given on campus. (See Graduate Qualifying Examination section)
3. To provide feedback to the student via formal evaluation *at least once a year* and via S/U grades awarded for the research courses 7979 and 7980. The Chair should complete the formal review (see GAO or HR for form), in consultation with the Supervisory Committee, and submit this form as instructed.
4. To formally meet at least once when the work on the dissertation is at least 50% completed to review procedure, progress, and expected results and to make suggestions for completion
5. To meet when the dissertation is completed and conduct the final oral examination to assure that the dissertation is a piece of original research and a contribution to knowledge. The entire Supervisory Committee must participate in the final examination in compliance with Graduate Council policies, whereby the Chair or co-Chair must be physically present and the other members are permitted to participate from remote sites via technological means. Only members of the official supervisory committee may sign the dissertation and they must approve the dissertation unanimously (see Graduate Catalog).

3.6.1.3. Meetings

The student must schedule annual meetings (or even semi-annual as the student advances into their 3-5th year) with their Supervisory Committee. These meetings can be one-on-one or collective. Meeting with the student's Supervisory Committee is a critical and required component in progression towards the Dissertation. As such, regular communication is important to ensure adequate time for feedback prior to defending.

3.6.2. Departmental Comprehensive Examination

The Departmental Comprehensive Examination (DCE) is one of the first major milestones of a student's doctoral tenure.

3.6.2.1. Exam Philosophy

The goal of the Departmental Comprehensive Examination is to assess proficiency and potential for a successful career in original biomedical engineering research at the doctoral level. As such, this exam is designed to assess the student's:

- breadth and depth of knowledge of their field of interest in BME
- capacity for critical analysis of literature
- independent thinking and decision making ability
- aptitude for application of knowledge to push new boundaries in BME

3.6.2.2. Eligibility, Timing, and Requirements

All Ph.D. students must take the Departmental Comprehensive Examination as a part of the requirements for admission to Ph.D. candidacy. Only students in good academic standing are permitted to take the examination.

Ph.D. students must take the exam during the examination period offered at the end of the Spring semester of their 1st year of study. Students that enter the Ph.D. program in the Spring can elect to take the examination at the end of that semester or defer the examination for 1 year.

The GAO will notify each student of their eligibility for examination during the Spring semester. Examination selections (see below) will be sent 5 weeks prior to the examination date. Finalization of selection must be made by 4 weeks prior to the exam date. At 2 weeks prior to the examination, the student will be notified of the assigned date, time, location, and committee makeup. The written report must be submitted to the GAO 5 *working* days (e.g. Mon-Fri) prior to the date of the oral examination.

3.6.2.3. Format of Departmental Comprehensive Examination

The format for the examination consists of both a written and oral component. To provide an appropriate format for meeting the exam philosophy, the examination of each student will be tailored according their selected research area in the field of biomedical engineering (see Section 3.3). Specifically, these research areas are:

- Biomaterials & Regenerative Medicine
- Biomechanics & Bionics
- Biomedical Imaging & Applications
- Molecular & Cellular Engineering
- Modeling & Biomedical Data Science
- Neural Engineering

The examination will be conducted by three committee members designated to be within the same research focus as the student under examination (see Section 3.6.2.4 for more details).

At 5 weeks prior to the examination period, students will be provided with their examination selections, which consist of 3 peer-reviewed research articles, to consider. The students will have 1 week to select one of the articles to evaluate. During the subsequent weeks, they will work on their written and oral reports on the publication. As this is an examination, students are expected to work independently; however, informal discussion with other students or faculty to clarify concepts or gain knowledge is permitted.

The written report should **not** be a summary of the article, but an in-depth critique of the critical points of the manuscript. The report should provide **critical analysis** of the clinical problem/need, the experimental approach, the results, and the author's interpretations. The write up should be grammatically correct, with appropriate brevity, clarity, context, and analysis, and observing a maximum of 2 pages (single spaced, Arial/Times New Roman, 11-12 pt, 1" margins; additional references can be placed outside of this 2 pg limit). This report must be submitted to the GAO 5 *working* days prior to the scheduled oral examination.

The oral report is expected to provide an appropriate summary and critique of the publication. In this closed examination, the student should target on giving a 20-25 min formal presentation that covers the key aspects of the manuscript, including Background, Methods, Results, and

Conclusions, with a focus on conveying knowledge of concepts covered in the manuscript and providing critical analysis of the results and interpretations, including topics such as future directions, additional controls, and pitfalls/weakness. During the presentation, the student may be periodically interrupted by questions from the committee. Further, additional questions may be asked at the end of the presentation. Questions will fall within the general scope of the manuscript under review. The total duration of the examination should be 60 min.

During the written and oral examination, it is expected that the student:

- Demonstrate an understanding and communicate the appropriate background and context on the problem addressed in the manuscript
- Describe any and all methods employed in the study
- Characterize, interpret, and critique the results of the data
- Summarize and critique overall implications of the study
- Rigorously defend his/her critiques on the interpretation of the study

3.6.2.4. Departmental Comprehensive Committee

The Departmental Comprehensive Examination is administered by a faculty committee consisting of 3 professors, with 1 member designated as the Chair. The Graduate Coordinator will appoint the Departmental Comprehensive Examination Committee and the respective Chair, seeking to match faculty within the research area selected by the student.

The primary research advisor of the student under examination may not serve on the examination committee. As a closed examination, the only faculty that may be present during the examination are the members of the DCE Committee and, potentially, the Associate Chair of Graduate Programs.

To be eligible to serve on the DCE Committee, a faculty must hold:

- A faculty appointment as Professor, Associate Professor, or Assistant Professor in the Department of Biomedical Engineering.
- Exceptions. The Graduate Coordinator may elect a committee member not meeting the above criteria to ensure adequate representation of faculty within the student's elected field of research. To be considered for approval, the Associate Chair must:
 - Review the curriculum vitae of the potential committee member to ensure adequate expertise in the targeted research field
 - Meet with the potential committee member to review the philosophy and policies of the examination to ensure consistency

The Chair of the DCE Committee must be a primary faculty member of the BME department. The Chair serves to ensure uniformity and parity to the examination. The Chair will also serve to ensure the examination proceeds on time and that questions are fair and appropriately within scope. Further, the Chair will be responsible for directing the discussion at the termination of the examination, recording the final votes, writing up the final examination report, and submitting these results to the GAO.

3.6.2.5. Departmental Comprehensive Examination Results

Following completion of the examination, the student will be dismissed and the committee may then engage in discussion regarding the student's exam performance. Members will follow the *Departmental Comprehensive Examination Rubric* (GAO provides form) for guidance on examination standards. Discussion will be based on both the written and oral

components of the examination. Appropriate and detailed comments for each examination metric should be provided, with the Chair serving to condense comments in the Department Comprehensive Examination Result form. Comments should be tailored to provide constructive and specific feedback of identified strengths, weakness, and/or deficiencies.

Following completion of the discussion, the committee will take a PASS / NO PASS vote. Voting must be finalized prior to the committee's adjournment. The final recommendation is that of the majority votes and the vote does not have to be unanimous. The final majority recommendation PASS / NO PASS must be recorded on the *Department Comprehensive Examination Result* form.

Vote options:

- **PASS**
 - ***With Recommendations*** –
 - Only *Weaknesses* are identified during the course of the examinations
 - Recommendations are not strictly enforced and only serve to assist in promoting further improvements to the student's training
 - ***With Conditions***
 - These are *Weaknesses* and a *Deficiency* (no more than 1) identified during the course of the examination
 - Conditions are strictly enforced and must be addressed within one year of the examination
 - Conditions are clearly outlined and enforceable (e.g., taking and achieving a B grade or better on a specific course)
- **NO PASS**
 - Student has demonstrated *Deficiencies* in 2 or more areas of the examination
 - If this is the first time the student has taken the examination, strong recommendations and conditions should be provided to assist in guiding the student to address these deficiencies

Note that the ***DCE Committee will not convey the results of their vote to the student***, as this will be formally transmitted to the student following certification (see Section 3.6.2.6)

3.6.2.6. Reports and Records of Departmental Comprehensive Examination

The Chair of the examination committee is responsible for submitting the DCE Result form to the GAO on the day of the examination. The Associate Chair will certify the report and recommendations. They will then email the official result and recommendations to the student, with copy sent to the student's research advisor, within 7 days after the examination. A copy of the results will also be retained within the student's file. Students may request to review the full results, as well as individual rubric forms, by contacting the GAO.

3.6.2.7. Departmental Comprehensive Exam Retakes

Only one retake is permitted. All retakes should be scheduled as soon as possible, depending on the recommendations and conditions outlined in the NO PASS vote. This is typically within 2-3 months, but no longer than 6 months, after the original examination. The same committee members are expected to serve on the retake examination, unless requested and approved by the Associate Chair. If a second NO PASS is given or if the DCE is not retaken within 6 months, the student may elect to transfer to the MS program, as they will be dismissed from the PhD program.

3.6.3. Graduate Doctoral Qualifying Examination

3.6.3.1. Exam Philosophy

The Graduate Doctoral Qualifying Examination is the final milestone to qualify the student for Ph.D. candidacy. The examination seeks to review the qualifications outlined in the Departmental Qualifying Examination, as well as to provide a rigorous review of the student's selected research proposal and breadth of knowledge in the student's research area. As such, it consists of a written research proposal, which is defended orally. Of critical importance in the examination is ensuring that the student's research project:

- seeks to encompass a single unified concept with sufficient focus and structure
- applies both engineering and biomedical components
- possesses the major characteristics of the scientific method, specifically objectivity and reproducibility.
- is feasible within a reasonable graduate student tenure
- seeks to provide an original and significant contribution to the field of biomedical engineering.

3.6.3.2. Eligibility, Timing, and Requirements

All Ph.D. students must take the Graduate Qualifying Examination as a part of the requirements for admission to Ph.D. candidacy and only *after* successfully passing the Departmental Qualifying Examination (PASS with Recommendations or PASS with Conditions that have been met). Exceptions to this policy can be made only with approval from the Associate Chair. Only students in good academic standing are permitted to take the examination.

Ph.D. students may take the examination as early as their third semester of graduate study and are expected to pass the examination within 2.5 years of doctoral study.

The student is responsible for scheduling their examination and should reach out to their Supervisory Committee to coordinate schedules. The student must work with the GAO for coordinating exam logistics (e.g. room reservations), whereby the exam must be scheduled at least 1 month in advance. Further, Doctoral Qualifying Exams are public events, so the date and time of the examination may be published. Finally, the student should come to the GAO to pick up required forms (Examination Rubric and Qualifying Exam Signature Forms) for this exam at least 1 week in advance. The examination may be delayed for those who do not adhere to these rules.

3.6.3.3. Graduate Examination Committee

The Graduate Qualifying Examination is administered by the student's Ph.D. Supervisory Committee (see Appointment of Supervisory Committee section for details). The entire Supervisory Committee is required to participate in the qualifying examination in compliance with Graduate Council policies, i.e. the Chair or co-Chair must be in the same physical location as the student and other members are permitted to participate from remote sites via technological means.

3.6.3.4. Format of Graduate Qualifying Examination

The format for the Graduate Qualifying Examination is a dissertation proposal consisting of both written and oral components. The goals are to outline a cohesive research plan with a central hypothesis or objective, with specific aims seeking to rigorously test this hypothesis or

meet this objective. Each student should work closely with their full Supervisory Committee in preparing the written and oral components of this proposal.

The proposal represents a starting template for how the central hypothesis will be tested. While the aims and experimental plans may evolve as the project progresses, the proposal should seek to clearly outline the scope of the research and the plan for carrying out the proposed study. It also provides a formal means for the Supervisory Committee to provide input on the direction and implementation of the research strategy. It should, however, be reexamined, by your committee, at least annually.

The written format should follow the style and content of a formal scientific document. The proposal should be succinct and clear. The final format for the document is guided by your Doctoral Advisor, but the minimum recommended standards are outlined below. Note the indicated number of pages per section are recommendations only. Students should seek advice from their Doctoral Advisor and Supervisory Committee for specific guidance.

- 10-15 pages, single spaced, Times New Roman or Ariel, 11/12pt, 1" margins
- Title/Abstract (1 page) – Abstract should be ~ 200 words.
- Central Hypothesis/Objective and Specific Aims (1 page) – hypotheses or objectives should be written in the correct form and aims should seek to rigorously test these hypotheses or objectives
- Background and Significance (3-4 pages) – provides context for the central hypothesis and ensure that the work outlined is original and of relevance
- Preliminary Results (1-3 pages) – establishes the feasibility of the aims
- Research Plan (4-6 pages) – outlines the proposed plan for how the aims will be rigorously tested. Descriptions as to how data will be collected, analyzed, and interpreted should be included. Special emphasis should be given to experimental design in order to test specific hypotheses and inclusion of adequate experimental and control groups. Discuss potential challenges and pitfalls of the approach, as well as alternatives.
- Safety (0.5 - 1 page) – relevant safety considerations should be clearly described and steps to be taken to ensure safe research practice described. ***This section is required of all students, regardless of research topic.*** Students whose research does not pose any foreseeable safety concerns must explicitly state this in their proposal and this statement must be critically evaluated by the Supervisory Committee.
- Literature Cited (not counted towards overall length) – list references using a standard citation format that also includes all authors and the full title of the cited reference (use of citation software *strongly* encouraged)
- NIH Style Biosketch of the student (see <http://www.ncbi.nlm.nih.gov/myncbi/> to generate one that is continually updatable; samples are also provided on this website).

The written portion of the proposal must be submitted to the Supervisory Committee and the Graduate Coordinator (for retention in student's records) 2 weeks prior to the scheduled oral examination. Electronic format is permitted, but paper format must be provided upon request. If the student does not submit this on time, the examination may need to be rescheduled (at the discretion of the committee).

The oral report is expected to provide an appropriate summary of the proposal. Handouts of the slides is suggested to facilitate discussion. This formal presentation should be 30 min long and cover the key aspects of the proposal, including Central Hypothesis, Specific Aims, Background and Significance, Preliminary Results and Research Plan. Following the formal

presentation, a 30-50 min question and answer session is expected (although questions may be asked throughout the presentation). Students are expected to address questions directly and to demonstrate their capacity to rigorously defend all aspects of their research plan. While the Doctoral Advisor may ask questions and provide input when requested, the primary responder to questioning should be the student.

3.6.3.5. Examination Results

Following completion of the examination, the student will be asked to leave the room and the Supervisory Committee will engage in discussion regarding the student's exam performance. Members will follow the *Graduate Qualifying Examination Rubric* (student provides form) for guidance on examination standards. Discussion will be based on both the written and oral components of the examination. Appropriate and detailed comments for each examination metric should be provided, with the Chair (Doctoral Advisor) serving to condense all comments in the Graduate Qualifying Examination Result form. Comments should be tailored to provide constructive and specific feedback of identified strengths, weakness, and/or deficiencies.

Following completion of the discussion, the committee will make a collective PASS / NO PASS recommendation. The vote must be unanimous and take place at the conclusion of the examination prior to the committee's adjournment. The final vote is binding and recorded on the *Graduate Doctoral Qualifying Examination Result* form.

Vote options:

- **PASS**
 - ***With Recommendations*** –
 - Only *Weaknesses* are identified during the course of the examinations
 - Recommendations are not strictly enforced and only serve to assist in promoting further improvements to the student's training
 - ***With Conditions*** –
 - These are *Weakness* and a *Deficiency* (no more than 1) identified during the course of the examination
 - Conditions are strictly enforced and must be addressed within one year of the examination
 - Conditions are clearly outlined and enforceable (e.g. modification of aims, review of concepts in biomaterials)
- **NO PASS**
 - Student has demonstrated *Deficiencies* in 2 or more areas of the examination
 - If this is the first time the student has taken the examination, strong recommendations and conditions should be provide to assist in guiding the student to address these deficiencies

3.6.3.6. Reports and Records of Examination

The Chair (Doctoral Advisor) is responsible for submitting the Graduate Doctoral Qualifying Examination Result form, with recommendations, to the GAO on the day of the examination. The GAO then will certify the report and recommendation, and upload this into the graduate management database (which the student can review at <http://gradschool.ufl.edu/gimspportal/gatorlink/portal.asp>). The student's examination rubric will be available to the student upon request.

3.6.3.7. Exam Retakes

Only one retake is permitted. All retakes should be scheduled as soon as possible, depending on the recommendations and conditions outlined in the NO PASS vote. This is typically within 2-3 months, but no longer than 6 months, after the original examination. If a second NO PASS is given or if the examination is not retaken within 6 months, the student may elect to transfer to the MS program, as they will be dismissed from the PhD program.

3.7. Final Examination and Doctoral Dissertation Defense

3.7.1. Dissertation Sufficiency

It is *strongly* recommended that the student hold a Dissertation Sufficiency meeting with the entire Supervisory Committee, either as a group or individually, 4-6 months prior to the anticipated Doctoral Dissertation Defense date. This meeting should include a formal presentation of the research progress made to date. While not required, this meeting serves to identify any potential deficiencies that the committee may identify in the research *prior* to the formal defense. A Dissertation Sufficiency meeting can be extremely helpful in maximizing progress by identifying and addressing these potential issues before the final defense meeting.

3.7.2. Eligibility, Timing, and Requirements

Within six months prior to graduation and after completion of all other prescribed work for the degree, the doctoral candidate should discuss with their Supervisory Chair when to schedule the Doctoral Defense (Final Examination).

The student is expected to be in charge of scheduling of their examination in coordination with both their Supervisory Committee and the GAO. Note that the UF Graduate School has deadlines for defense dates, so these should be reviewed prior to scheduling the oral examination. The student must work with the GAO for coordinating the examination by submitted in a completed *Doctoral Dissertation Oral Defense Announcement* form at least 1 month in advance of the planned defense date. A public announcement will then be generated using this information and circulated and a room suitable for broad attendance will be used. Finally, the student should come to the GAO to pick up required forms (Examination Rubric and PhD Dissertation Signature Forms) for the thesis defense at least 1 week in advance. Graduation may be delayed for those who do not adhere to these rules.

Again, note that the deadlines required by the Graduate School for submission of the written portion of the thesis are posted on the UF Academic Calendar and should be reviewed to ensure timely submission of all required documents. *It is solely each student's responsibility to ensure that all required forms and documents are submitted in accordance with Department and Graduate School deadlines in manner that permits adequate time for the GAO to process and upload these documents.*

3.7.3. Ph.D. Dissertation Defense Committee

The Graduate Dissertation Defense Examination is administered by the student's Ph.D. Supervisory Committee. The entire Supervisory Committee is required to participate in the final examination in compliance with Graduate Council policies, i.e. the Chair or co-Chair must be in the same physical location as the student and the other members are permitted to participate from remote sites via technological means.

3.7.4. Format of the Doctoral Dissertation Examination

The Ph.D. final examination consists of a written doctoral dissertation and an oral defense of the research results that are described in the written document. The goals are to outline the completion of a cohesive research plan with a central hypothesis and specific aims that rigorously test the hypothesis. Each student should work closely with their Supervisory Committee in preparing the written and oral components of their final dissertation. Specific formatting requirements for the written portion of the examination are defined by the Graduate School, so students are required to follow the formatting requirements defined therein, see website for requirements and Checklist for Doctoral Dissertations: <http://gradschool.rgp.ufl.edu/editorial/introduction.html>.

Dissemination of research findings is a critical component of the education and training leading to a PhD degree. As such, it is expected that a student's original, scientific contributions will be submitted for scholarly publication in archival refereed journals. Given that the field of BME is highly diverse, the number and nature of the publications resulting from a dissertation will vary. As such, students should work closely with their Doctoral Advisor and Supervisory Committee to ensure that they are meeting these expectations. The supervisory committee will take progress towards this goal as one of the key elements in evaluating if and when a student is ready for defense of his/her dissertation.

The written portion of the dissertation must be submitted to the Supervisory Committee 2 weeks prior to the scheduled oral examination. Electronic format is permitted, but paper format must be provided upon request. If the student does not submit this on time, the examination must be rescheduled.

The oral report is expected to provide an appropriate summary of the dissertation. Handout of the slides is suggested to facilitate discussion. This formal presentation is public, should be approximately 45 min long, and cover the key aspects of the proposal, including Central Hypothesis, Specific Aims, Background and Significance, Results, Discussion, and Future Directions. Following the formal open presentation, a dedicated question and answer session is expected, wherein the first section is for the general audience and the second section is closed to only the Supervisory Committee and the student. Students are expected to address questions directly and to demonstrate their capacity to rigorously defend all aspects of his/her research plan. Further, the Supervisory Committee is free to ask additional questions on general BME and selected minor subjects, as well as matters pertaining to the student's field of study. While the Doctoral Advisor may ask questions and provide input when requested, the primary responder to questioning must be the student.

3.7.5. Examination Results

Following completion of the examination, the student will be asked to leave the room and the Supervisory Committee will engage in discussion regarding the student's exam performance. Members will follow the *Doctoral Final Examination Rubric* (form provided by the student) for guidance on examination standards. The discussion will be based on both the written and oral components of the dissertation. Appropriate and detailed comments for each examination metric should be provided, with the Chair (Doctoral Advisor) serving to condense all comments in the Doctoral Final Examination Result form. Comments should be tailored to provide constructive and specific feedback of identified strengths, weakness, and/or deficiencies.

Following completion of the discussion, the committee will make a collective PASS / NO PASS recommendation. The vote must be unanimous and take place at the conclusion of the examination prior to the committee's adjournment. The final vote is binding and recorded on the *Doctoral Final Examination Result* form.

If PASS, all committee members must sign the Doctoral Final Examination Results. In addition, they should sign the Dissertation approval signature page³.

If NO PASS, the committee members should specifically outline deficiencies the student must address prior to reexamination, select the "No Pass" option, and sign the Doctoral Final Examination Report.

3.7.6. Reports and Records of Examination

The Chair (Doctoral Advisor) is responsible for submitting the *Doctoral Final Examination Results* to the GAO on the day of the examination. This form is required on the day of the examination and cannot be submitted later. The Dissertation Approval signature page may be submitted later by the student, if there are outstanding issues with the written portion. The GAO then will certify the report and recommendation, and upload this into the graduate management database (which the student can review at (<http://gradschool.ufl.edu/gimsportal/gatorlink/portal.asp>)). It is the student's responsibility to ensure that all forms are submitted to the GAO with adequate time for certification and uploading.

PhD Students should also review the Checklist for Doctoral Dissertations from the Graduate School website for additional Graduate School requirements: <http://gradschool.rgp.ufl.edu/editorial/introduction.html> .

3.7.7. Dissertation Defense Retakes

Only one retake is permitted. All retakes should be scheduled as soon as possible, depending on the recommendations and conditions outlined in the NO PASS vote. This is typically within 2-3 months, but no longer than 6 months, after the original examination. If a second NO PASS is given or if the examination is not retaken within 6 months, the student may elect to transfer to the MS program, as they will be dismissed from the PhD program.

³ In cases where the Supervisory Committee has identified issues with the written report that the student must address prior to final approval, the committee must specifically outline these outstanding issues and may elect to not sign the Doctoral Dissertation signature page at the time of the oral examination. In this case, the student is responsible for collecting all signatures, by the appropriate deadlines, once the issues have been addressed.

3.8 CURRICULUM FOR GENERAL PH.D. DEGREE

BME Core Requirements (9 credits total):

Course			Semester completed	Grade earned
BME5401	Biomedical Engineering & Physiology ^a	3		
BME6018	Clinical Correlations	3		
	BME Math Requirement	3		

^aBME5401 may be waived if student provides documentation of taking at least 3 credits of physiology at a graduate or undergraduate level with a grade of B or better. This 3 credit is then replaced with an alternative BME course.

^bSee Course listings at www.bme.ufl.edu/academics/course_listings/graduate for designated BME Math courses that meet this requirement

BME Electives (6 credits total)^c:

Course			Semester completed	Grade earned

^cAny graduate-level BME-prefix course (excluding any S/U graded course or BME 6905).

Specialization Electives (12 credits)^d:

Course			Semester completed	Grade earned

^dAny graduate-level course in the College of Engineering or College of Medicine (can include BME courses). Excludes any S/U graded courses and BME 6905

Supervised Teaching (4 credits)^e:

Course			Semester completed	Grade earned
BME 6940				
BME 6940				

^eEnrollment timing requirements and credit allocation per course are outlined in Section 3.4.4

Ph.D. Research Credits (# required to reach a total of 90 credits)

BME 7979	Doctoral Research (pre-qualifying)
BME 7980 ^f	Doctoral Research (post-qualifying)

^fStudents must enroll in either 2 (for Summer) or 3 (for Fall or Spring) credits of BME 7980 in their final graduating term

TOTAL CREDITS REQUIRED: 90