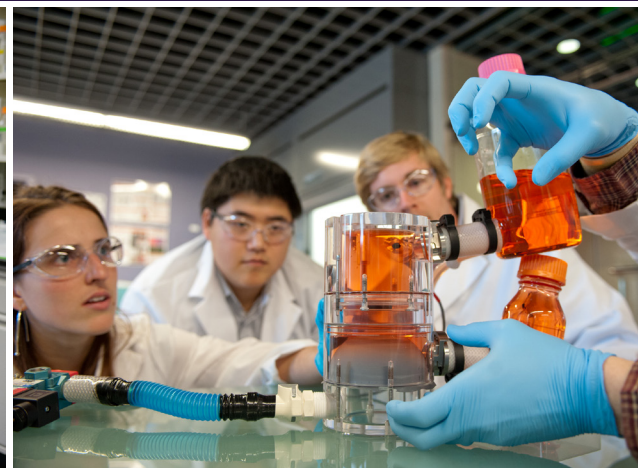
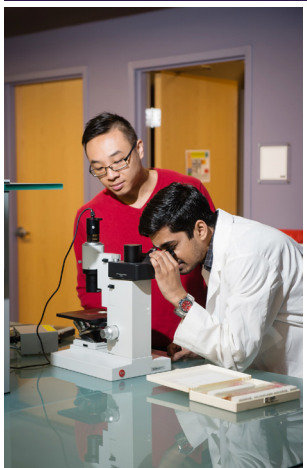




Graduate Handbook

Catalog Year: 2021-2022



Department of
BIOENGINEERING
Clemson University

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1. Welcome and Introduction

1.1 Welcome and Purpose of Manual

Welcome to the Bioengineering Department at Clemson University. We are happy you have joined TEAM-BIOE.

This manual has been prepared to acquaint you, as a graduate student, with the basic policies and operating procedures of the Department of Bioengineering and to call attention to your duties and responsibilities throughout your graduate experience. The Graduate School sets the basic policies for all graduate programs and is responsible for final decisions in policy matters. The most important rules and regulations of the University that apply to graduate students are described in the Graduate School Policy Handbook accessible at this link:

<https://www.clemson.edu/graduate/students/policies-procedures/index.html>

Information, resources, rules, and regulations presented in the Graduate School Policies and Procedures could be discussed, where necessary, with your faculty advisor and with the Department Chair. Exceptional cases will be referred to the office of the Graduate Dean.

The department's mission is to educate and prepare students for professional careers in bioengineering for global competitiveness and to develop and disseminate bioengineering knowledge through research and engagement in economic development to advance health innovation and biotechnology in alignment with Clemson's land-grant mission.

Our vision is to be a globally renowned department of bioengineering. Clemson Bioengineering contributes to Clemson University's overall mission and its Clemson Forward strategic initiatives by working toward meeting five specific strategic goals:

1. Strengthen our reputation as a global leader in undergraduate bioengineering education.
2. Support Clemson's goal of maintaining R1 level as a research institution.
3. Provide a supportive environment conducive to graduate student success.
4. Support economic development through translational research and technology innovation.
5. Increase national and international visibility of the department.

1.2 Contact Information

Department Chair

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301 Rhodes Research Center
Clemson University, Clemson SC 29634
Phone: 864-656-5556
Email: laberge@clemson.edu

Graduate Student Services Coordinator

Trish Nigro
304 Rhodes Annex
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Graduate Program Coordinator

Dr. Agneta Simionescu
501-1 Rhodes Research Center
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Phone: 864-656-3729
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Coordinator of Professional Development and M.Eng. Program

Jennifer Hogan
302 Rhodes Annex
Clemson University, Clemson SC 29634
Phone: 864-656-0746
Email: jrhogan@clemson.edu

1.3 University Communication

Communications from offices across campus are sent to your Clemson email address (name@clemson.edu). Your Clemson email address should be marked as the preferred email address in iRoar. Information about setting up email is found on the Clemson Computing and Information Technology (CCIT) website: <https://ccit.clemson.edu/support/new-to-clemson/>. For username and password issues, please contact the IT Helpdesk at ithelp@clemson.edu or 864-656-3494. Information about Two Factor Authentication can be found on CCIT's website.

CU Safe Alerts inform students, faculty and staff of emergencies or disruptions to campus services. CU Safe Alerts are sent to all @clemson.edu email addresses. They can also be sent to you as a text message on your cell phone. For more information, please visit CU Safety's website: <https://www.clemson.edu/cusafety/operations/warnings.html>. More resources for campus information and where to find updates can be found on Clemson University's Inclement Weather website: <https://www.clemson.edu/cusafety/inclement-weather.html>

Students will need to check their University email account frequently for department correspondence. This will be the primary method of communication used by the University and the Department of Bioengineering. It will be your responsibility to keep up with the information sent to your Clemson email account.

2. Academic Regulations

2.1 Orientation

Clemson University orientation for new graduate students will be conducted in person and/or online. Orientation conducted by the Graduate School, The International Office and the department will be announced by email prior to arrival. A [New Student To Do List](#) can be found on the Graduate School's website. It is highly recommended that all new students review the First Things First, Before You Arrive and the Once You Get Here drop-down menu.

2.2 Student Responsibilities

The faculty members and staff in the Department of Bioengineering expect you to approach your graduate activities in a professional manner, by focusing on your studies and research.

You are encouraged to pursue a core plan of study as defined in the [Plan of Study \(GS2 form\)](#). Please refer to each degree program for departmental degree requirements.

Credit for undergraduate courses cannot be applied toward a graduate degree; however, a semester grade of at least a "B" must be achieved to satisfy an undergraduate course deficiency requirement. A "C" grade will be subject to review by the student's advisor in consultation with the faculty. If a graduate student receives a grade of "D" or lower in an undergraduate course, he or she must repeat the course and such a repetition will be allowed only once during the student's graduate program

2.3 Maintaining Academic Standing

A graduate student must maintain a minimum overall grade point average of "B" for all courses taken. If at any time a student fails to satisfy this requirement, s/he is automatically placed on probation for one semester during which time s/he is not eligible for financial aid. A graduate student is permitted only one probationary semester during the entire course of her/his graduate program. In addition, a failing grade (D or F) in a course in the area of the student's major may be cause for dismissal regardless of the student's cumulative grade point average.

2.4 Course Load

By University policy, full time status is defined as being enrolled in at least 9 credit hours in fall and spring; and at least 6 credit hours in the full summer session.

2.5 Communication Skills

The ability to communicate ideas accurately and effectively is indispensable to any field of technical endeavor and every candidate for an advanced degree in bioengineering must demonstrate a high level of competence in communication skills, including verbal presentation, written communication (papers), and graphic display, e.g., slides, movies, models, charts, drawings, etc.

A minimum exposure to public speaking will be provided by the required Graduate Seminar. Further speaking experience will be gained by periodic presentations to the thesis committee and in the final thesis defense. Additional speaking experiences, especially at technical society meetings, should be actively pursued and are encouraged by the Department.

Similarly, preparation of term papers and collaboration with your advisor in report writing will provide experience in technical writing. It is highly recommended that the graduate student shows evidence of scholarship such as peer-reviewed manuscripts and conference abstracts as well as patents if applicable. The principal writing experience will be the preparation of the Ph.D. dissertation or M.S. thesis.

2.6 Clinical Internship

The Bioengineering Department offers an internship course to expose graduate students to bioengineering in the clinical arena. In general, medical problems are solved by two types of engineers in industry — engineers involved in the development of a health care technology and those involved in the practical application of a technology. Both types of activities require that the individual have a working understanding of the state of the art of the medical industry and an appreciation for its immediate and long-term needs. Internships provide time so that the course material and laboratory experiences provided in the classroom setting may be assimilated with applications learned from the internship. Internships may be pursued at a clinical or an industrial site pending approval by the student's advisor and the advisory committee. The student must provide a written statement from a preceptor at the internship site describing the scope of the internship and activities in which the intern will participate. This information is provided to the instructor of record for BIOE 8900. As BIOE 8900 is a variable credit course, students must confer with the course instructor and their advisor before registering for credits.

2.7 Laboratory Notebooks

Following verification with the student's advisor, each student involved in research should obtain a laboratory notebook at the inception of his/her research program. All research activities are to be recorded either in the lab notebook or other media approved by the student's advisor. At the termination of the student's affiliation with the department, all lab notebooks and all recording media must be submitted to the student's advisor as along with an electronic version of all research materials generated during progress toward a degree. The lab notebooks and all research materials that have been accumulated during the research period, including charts, specimens, photographic materials or instruments, remain the property of the department. The student may retain copies of these materials. The real value of the complete and detailed lab notebook can be appreciated only at the end of a research program, when the dissertation, thesis, journal paper, or final report must be prepared. Maintenance of the lab notebook will be an important consideration in assessing a student's progress in his/her graduate program.

2.8 BIOE 8000 – Graduate Seminar for MS-Thesis and Ph.D. Students

BIOE 8000, the Seminar in Bioengineering, provides a forum for presentation and discussion of student conducted research. This course is designed to simulate professional presentation at a national scientific meeting and other professional venues. In addition, during the academic semesters, the Department hosts topical seminar speakers, leaders in their fields from outside institutions. Many good ideas come from listening to presentations in areas outside of the student's dissertation research area.

All graduate students enrolled in Bioengineering and those whose research advisor is a faculty of the Department of Bioengineering are required to attend on a regular basis and to present annually their individual research project or some related subject. Exceptions will have to be negotiated on an individual basis with the department chair and approved by the advisor.

Seminar in Bioengineering has always been an important colloquium in our department, as well as in all the other bioengineering departments in the country, as part of the Biomedical Engineering community.

Students with conflicts with other classes or TA duties can be excused. Please notify professor of course.

2.9 Your Advisor and Advisory Committee

Please refer to the Graduate School Academic Regulations for policy and procedures:

<https://www.clemson.edu/graduate/students/policies-procedures/index.html>.

Procedure: A student must select an advisory committee in consultation with their advisor. Once advisory committee members are selected and approved, the student, department and committee members are notified of the fully constituted committee by means of the approved GS2 Plan of Study. The GS2 Plan of Study is available on IROAR to be submitted electronically to the Office of Enrolled Student Services. Instructions on how to submit the advisory committee and the plan of study can be found on the Graduate School's website.

Students pursuing a **master's** or specialist's degree must select an advisor and submit their Plan of Study (curriculum) by the middle of their second semester; doctoral students must select an advisor and submit their Plan of Study no later than the beginning of your fourth semester of study following matriculation. After these deadlines, students may be blocked from registering for future courses until they submit a plan of study.

Review your program's graduate program handbook for the written procedures for selection of the major advisor. The Graduate School supports your right to have significant control over the selection of your major advisor (including the ability to change advisors) and your advisory committee.

A minimum of three faculty members are to be selected by a student seeking a master's thesis or non-thesis degree, and a minimum of four faculty members are to be selected by a student seeking a doctoral degree. The majority of the advisory committee, including the major advisor, must be comprised of Clemson University faculty who hold full-time, tenure-track positions. Either the major advisor or at least half of the committee must hold rank in the program offering the degree. If a minor is declared, the committee must include a representative of the minor program.

Academic programs at the Master's or Education Specialist's level that are non-thesis and do not have a final exam or culminating assessment (i.e., do not submit the GS7M) may choose to establish an alternative student committee structure for the purpose of curriculum guidance. Such programs may choose to appoint a single faculty member or professional advisor to serve as the advisory chair, with no other committee members required. Any program requiring any form of comprehensive assessment (e.g., thesis, portfolio, final exam, etc.) that must be evaluated by an advisory committee is not permitted to use this advisory structure. The individual in this important role must be a full-time, permanent employee of Clemson; external individuals may not serve as advisory committee chair.

For the BIOE Department's M.Eng. program, the program director can serve as the advisory chair. The M.S. Non-Thesis option can have the BIOE Graduate Director as the advisory chair. The M.S. in Medical Device Reprocessing can have the program director serve as the advisory chair.

Emeriti faculty may serve as advisory committee members but may not serve as chair of the advisory committee. Part-time visiting and other non-tenure-track faculty employed by Clemson University may serve on the advisory committee but may not serve as chair. Persons not employed by the University may serve on the advisory committee; in order to serve on the committee, first they must be approved by the department (in a faculty meeting). All duly appointed committee members have full voting status on the outcome of all examinations given by the committee. It is possible for co-chairs to direct the activities of the advisory committee. This special arrangement must be made with the consent of the dean of the Graduate School.

2.10 Change of Degree Policy

If a student decides to change the degree sought from Ph.D. to M.S. or M.Eng, the assistantship offer, if any, is automatically terminated. The Change of Degree/Major form can be accessed via IROAR. The request must be completed and approved by the appropriate departmental officials before submission to the Graduate School for approval.

2.11 Transfer Credits

The policy and procedure for transferring courses can be found in the [Graduate School's Policy and Procedures Handbook](#). There are instructions for the students to follow. Be sure to discuss with your advisor and/or advisory committee your proposal to use courses from another institution.

2.12 M.S. en route to Ph.D.

Doctoral students in the Department of Bioengineering who have successfully passed the qualifying exam and dissertation proposal may submit the [GS2-14 form](#) to document the fulfillment of requirements for an "en route" master's degree and the faculty's recommendation to award the "en route" master's degree. The requirements for the "master's en route" are the same as for the regular master's degree, and the same university deadlines apply for students pursuing this option.

The “en route” opportunity is available only for doctoral students who are continuously working towards the Ph.D. degree; it is not to be used as a substitute for the request for change of degree.

The GS2-14 form is due to the Graduate School the **semester prior to the semester** in which this degree is to be confirmed.

2.13 Review of Progress / Student Evaluation System

1. All M.S. thesis and Ph.D. students must submit Part I (Goals) of the Student Evaluation System (http://www.clemson.edu/cecas/departments/bioe/academics/forms/evaluation_form.PDF) to the Graduate Student Services Coordinator, and this document will be filed in the student's file within the first month of the semester. All graduate students will be reviewed at the end of their first year and each semester thereafter to assess their potential for continuation. Parts 2 (Self-Evaluation) and 3 (Advisor Evaluation) are due the last week of classes during the fall and spring terms. The evaluations are submitted to the Graduate Student Services Coordinator. Advisors will monitor enrollment and course performance to ensure the student is making academic progress towards the degree.

2. At the end of two years, the student's committee will review progress. If satisfactory progress has not been made toward the M.S. thesis or Ph.D. degree, the student is subject to dismissal.

3. At the end of each academic semester, all students must submit to their advisor Part II of the Student Evaluation System, as required following the guidelines located in the department website:
http://www.clemson.edu/cecas/departments/bioe/academics/forms/evaluation_form.PDF

4. The Student Evaluation System is used to renew assistantships. Work with your advisor to guarantee the evaluations are submitted in a timely manner. Failure to submit the evaluation can result in delays of your assistantship starting.

2.14 Awards

- **Austin T. Moore Leadership Award.** This award is given in memory of Austin T. Moore, MD, a pioneering orthopedic surgeon and researcher who has clearly marked the field of orthopedic implantology, and is made possible with grants from the Moore Orthopedic Clinic and Austin T. Moore, Jr. Brace and Boot Orthopedic Company in Columbia, SC. Annually, bioengineering faculty and staff in the Department nominate and/or support nominations of students for their leadership and service to the department in addition to their normal academic activities and significant progress in their academic and research program. The student's name will be engraved on a permanent plaque in Rhodes Hall.

- **Outstanding Graduate Teaching Assistant Award.** This award is given to an outstanding graduate teaching assistant who has been recognized by Bioengineering faculty and undergraduate students as an outstanding teaching assistant during the school year. The student's name will be engraved on a permanent plaque in Rhodes Hall.

- **Page Morton Hunter Bioengineering Graduate Researcher Award.** This award is given to a graduate researcher who has been recognized by Bioengineering faculty for conducting outstanding research during the school year. Dissemination of research (published papers, chapters in books, posters at conferences, patent applications, etc.), participation in grant writing, as well as translational and R&D activities will be considered for this award. This award is given in honor of Page Morton Hunter, in memory of her contribution and that of her husband to the Department of Bioengineering through the Hunter Endowment and is made possible by a grant from the Page Morton Hunter Endowment to the Department of Bioengineering. The student's name will be engraved on a permanent plaque in Rhodes Hall.

- The **R. Larry Dooley Entrepreneurship Award:** award was established in 2016 in recognition of Dr. Dooley's legacy as a mentor and innovator. The student's name will be engraved on a permanent plaque in Rhodes Hall.

- The **Eugene M. Langan III Service Award** was established in 2020 in recognition of Dr. Langan's outstanding dedication and service to the Department of Bioengineering. Dr Langan is a world renown vascular surgeon and scientist that exemplifies service promoting and supporting the field of biomedical engineering, the Department of Bioengineering, its students and faculty. The student's name will be engraved on a permanent plaque in Rhodes Annex.

2.15 Academic Integrity

A university is a community of scholars dedicated to the inquiry into knowledge. It follows as a basic tenet that students will conduct themselves with integrity in academic pursuits. In instances where the academic standards may have been compromised, Clemson University has a responsibility to protect this process and to respond appropriately and expeditiously to charges of academic misconduct. The Department of BioEngineering takes academic integrity very seriously and pursues every option available to maintain our high academic standards, including writing up student offenses and following through with grade and/or dismissal sanctions if warranted. Students can become familiar with the rules and procedures by reading the Graduate School's Policies and Procedures guidelines (<https://www.clemson.edu/graduate/students/policies-procedures/index.html>).

3. Master of Engineering in Biomedical Engineering (M. Eng. in Biomedical Engineering)

3.1 Program Objectives

The M.Eng. in Biomedical Engineering degree program provides an in-depth advanced engineering education to students who have completed a Bachelor of Science degree in engineering and desire to embrace an industrial career in the field of medical technology development. The degree provides an intellectually rigorous professional graduate education that emphasizes clinical applications and biomedical engineering design to better train a workforce to sustain a growing biomedical industry in South Carolina and in the United States. This program is based on a biomedical engineering technical core and relevant clinical applications, providing the basis for strong technical contributions in industry. This program prepares engineering graduates for professional practice in BME and leadership roles in the biomedical science and technology private sector to help develop and sustain economic growth.

More specifically, students in the program will acquire a broad perspective of the biomedical engineering discipline that complements their undergraduate training in engineering or applied science. Graduates will be equipped to design medical devices and develop therapeutic strategies within the bounds of health care economics, the needs of patients and physicians, the regulatory environment for medical devices and pharmaceuticals, and stringent ethical standards of biomedical engineering practice. Overall, the program will graduate students who:

- Demonstrate advanced-level academic expertise and practical engineering experience necessary to function as biomedical engineering professionals in a modern, ever-changing world. (**Advanced Knowledge and Life-long Learning**)
- Display competence by being selected for employment by industrial, academic or government entities or further professional/graduate studies. (**Career Opportunities**)
- Understand the broad, social, ethical and professional issues of contemporary engineering practice. (**Awareness and Responsibility**).

To achieve these objectives, the Master of Engineering degree has the following student learning outcomes (SLO) set for its graduates:

1. An ability to apply mathematics, science, and engineering to advanced biomedical engineering problems).
2. An ability to proficiently design and validate experiments, systems, components, or processes to meet desired needs.
3. An ability to proficiently identify, formulate, and solve advanced biomedical engineering problems.
4. An ability to proficiently will keep up to date in knowledge of government, regulation, compliance, health hazards and ethics in biomedical engineering.
5. An ability to proficiently communicate technical and scientific knowledge.
6. An ability to proficiently use advanced techniques, skills, and modern engineering tools necessary for biomedical engineering practice.

3.2 Curriculum

The M.Eng. curriculum provides skills and expertise that enhance the individual's ability to contribute to the technical workforce. The degree will provide professionals in the technical workforce an opportunity to continue their education and development in the context of an advanced degree. The M.Eng. also serves the practicing engineer to further his/her career in the context of an application of engineering knowledge, as opposed to a Master of Science in a research context, which is focused on discovering new knowledge.

The minimum requirement for this degree is one year of full-time graduate study or its equivalent. Eligibility for graduation requires a minimum of thirty (30) graduate credits from mandatory core (15 credits) and technical elective (15 credits) courses. No thesis is required for this degree. A student who has previous graduate work at another institution that has not been used towards a degree may petition the Graduate Committee to transfer up to nine (9) semester credit hours of relevant coursework with grades of 'B' or better towards the M.Eng. degree.

Mandatory Core:

BIOE 8140 - Medical Device Commercialization (3 credits) (3,0)

BIOE 8600 - Biomedical Engineering Device Design Innovation (3 credits) (3,0)

BIOE 8610 - Biomedical Engineering Product Translation (3 credits) (1,6)

BIOE 8620 - Pre-Clinical Assessment and Regulatory Affairs for Medical Devices (3,0)

BIOE 8630 – Regulatory and Clinical Affairs for Medical Devices (3 credits) (3,0)

Recommended Elective:

BIOE 8900 - Internship (1-6 credits)

The additional credits of graduate technical elective courses should be selected from graduate-level course offerings in Bioengineering or other pre-approved courses.

Additional courses can include those required for the Certificate in Technology Entrepreneurship Program offered through Clemson's MBA program, the GreenMD Certificate Program offered through Clemson Bioengineering (Dr. Melinda Harman – Program Director), or the Certificate in Quality Science Program (Dr. Jeremy Mercuri – Program Director). For further information, please refer to the M.Eng webpage below or contact the M.Eng. Degree Program Coordinator (Mrs. Patricia Nigro) for assistance.

<https://www.clemson.edu/cecas/departments/bioe/academics/masters/m-eng.html>

4. Master of Science in Medical Device Reprocessing

4.1 Program Objectives

The MS degree in Medical Device Reprocessing educates students from across the STEM disciplines to optimize reprocessing technology supporting safe and routine reuse of medical devices. Medical device “reprocessing” involves the cleaning, disinfection, and sterilization of medical devices and healthcare products after each use. This cross-disciplinary program integrates fundamental principles of bioengineering and industrial engineering, medical device design, and quality science in an industry immersion/training program.

4.2 General requirements

The MS degree in Medical Device Reprocessing is a one-year sequence of 11 courses that includes a minimum of 30 hours of graduate credit that is delivered in a fully online program. These courses are taught by multi-disciplinary faculty and industry professionals. The knowledge and skills gained through this MS degree program will prepare globally engaged STEM students to be innovative leaders in sustainable biomedical technology for solving global health issues and addresses the shortage of biomedical engineers trained in reprocessing technology. Reprocessing is recognized as one of the top 10 regulatory science priorities by the US Food & Drug Administration and is an essential practice in healthcare delivery. This program supports workforce development in this sector, heeding calls for training and innovation in modern reprocessing technologies used to ensure medical device safety.

The graduate handbook you receive when you first begin this degree program, along with the Graduate School Policies and Procedures handbook current as to that same year, are your official guides to this program and may be slightly different than what appears in this catalog.

4.3 Curriculum

11-course sequence (30 credits)	Credits	Term
IE 8000 Human Factors	3	fall
BIOE 8660 Global Regulatory & Legal Framework of Quality	3	fall
BIOE 8150 Design, Manufacturing & Validation Methods for Reusable Medical Devices	3	spring
BIOE 8140 Medical Device Commercialization OR BIOE 8130 Industrial Engineering	3	spring
IE 6300 HF Eng. in Healthcare	3	spring
BIOE 8670 Product Development, Specifications, Process & Validation	3	spring
BIOE 8680 Risk & Failure Analysis	2	spring
BIOE 6380 Engineering Controls for Microbiological Systems BIOE 6381 Engineering Controls for Microbiological Systems Laboratory	3	summer

IE 6620 Six Sigma Quality		3	summer	
BIOE 8620 Pre-Clinical Assessment and Regulatory Affairs for Medical Devices	or	BIOE 8630 Regulatory and Clinical Affairs for Medical Devices	3	fall/spring
BIOE 8510 Mentoring Undergraduates Research Teams	or	BIOE 8900 Industry Practicum	1-6	fall/spring /summer

For more information about curriculum requirements and coursework **contact us** or review our **handbook**.

5. Master of Science in Bioengineering (Thesis and Non-Thesis)

5.1 Program Objectives:

The MS in Bioengineering is a program focused on fundamental and advanced topics in bioengineering, that provides a solid background for practicing and research engineers. The curriculum is designed around two basic options: a thesis option, for students with a strong interest in research, and a non-thesis option that concentrates on coursework, for students seeking industrial employment after graduation. Both options will provide students with a strong foundation of bioengineering knowledge and flexibility to meet their career objectives.

5.2 Non-Thesis Option

The Masters in Bioengineering (M.S. non-thesis) program requires a minimum of 30 credits of graduate course work hours and does not include a research requirement. The usual minimum time necessary to complete all requirements is 12-18 months. The Graduate program coordinator will assist the students in developing an individualized curriculum (to be outlined in the GS2 Plan of Study).

Students pursuing the MS degree via non-thesis option must satisfy the requirements listed below:

- a. At least half of the total graduate credit hours must be selected from 8000-level courses.
- b. Students must complete courses offered by the Department of Bioengineering.
- c. Students can enroll in a maximum six credits of Independent Study in Bioengineering (BIOE 8920) and/or internship (BIOE 8900) at an approved external location.
- d. Student must spend at least one academic semester in residence.

5.3 Thesis Option

The MS in Bioengineering with thesis (M.S. thesis) program requires a minimum of 30 graduate credit hours from mandatory core (5 credits) and technical elective (19 credits) courses, and the successful completion of a thesis (6 credits from BIOE 8910 – Master's Thesis Research). The usual minimum time necessary to complete all requirements is 18-24 months. The advisory committee will assist in developing an individualized curriculum (to be outlined in the GS2 Plan of Study).

Students pursuing the MS in Bioengineering with thesis option must satisfy the requirements listed below:

- a. The student must identify a faculty member to be their major advisor
- b. At least half of the total graduate credit hours must be selected from 8000-level courses (exclusive of thesis research).
- c. Student must spend at least one academic semester in residence.
- d. Students must complete a set of mandatory core courses before and select technical elective courses offered by the five research tracks: biomaterials, regenerative medicine, bioelectrical engineering, biomechanical engineering, cellular and molecular engineering.
- e. Student must successfully present and defend a thesis in an oral comprehensive examination, which will be open to the public.
- f. Student must submit an approved thesis to the Graduate Dean at least one week before the semester in which the degree is expected.

Guidelines for the thesis/dissertation formats are presented on the Graduate School's website:

<https://www.clemson.edu/graduate/students/theses-and-dissertations/index.html>

Mandatory Core

<i>BIOE 6150 – Research Principles</i>	<i>(1 credit)</i>
<i>BIOE 8000 – Seminar</i>	<i>(up to 2 credits)</i>
<i>BIOE 8460 – Biomedical Basis for Engineered Replacements</i>	<i>(3 credits)</i>

Recommended Tracks Electives

BIOMATERIALS ENGINEERING	REGENERATIVE MEDICINE	BIOELECTRICAL ENGINEERING	BIOMECHANICAL ENGINEERING	CELLULAR AND MOLECULAR ENGINEERING
<i>TRACK ELECTIVES:</i>	<i>TRACK ELECTIVES:</i>	<i>TRACK ELECTIVES:</i>	<i>TRACK ELECTIVES:</i>	<i>TRACK ELECTIVES:</i>
BIOE 8010 BIOE 8020 BIOE 8200 BIOE 8470 BIOE 6120 BIOE 6230 BIOE 8030 BIOE 8070 BIOE 8240/8241 BIOE 8410 BIOE 8700/8701 BIOE 6820/8820 BIOE 6490/8410 BIOE 8490	BIOE 8010 BIOE 8020 BIOE 8490 BIOE 8730 BIOE 8470 BIOE 6400 BIOE 8410 BIOE 8240/8241 BIOE 8200 BIOE 6120 BIOE 6230 BIOE 8740 BIOE 8750 BIOE 6820	BIOE 6310/6311 BIOE 6350 BIOE 8700/8701 BIOE 6710 BIOE 6450 BIOE 6820/8820 BIOE 6230 BIOE 8620 BIOE 8630 BIOE 8130 BIOE 8140 BIOE 8150 BIOE 8500 BIOE 8600 BIOE 8610 BIOE 8110	BIOE 6120 BIOE 6200 BIOE 6230 BIOE 8010 BIOE 6350 BIOE 6340 BIOE 8200 BIOE 8240 BIOE 8470 BIOE 8490 BIOE 8500 BIOE 6310 BIOE 6450 BIOE 6710 BIOE 6820/8820 BIOE 8200 BIOE 8020 BIOE 8030 BIOE 8110 BIOE 8150 BIOE 8700	BIOE 6400 BIOE 6420 BIOE 6470 BIOE 6490/8410 BIOE 8010 BIOE 8020 BIOE 8030 BIOE 8240 BIOE 8490 BIOE 8500 BIOE 8730 BIOE 6820 BIOE 8820 GEN 8100 BIOL 6030
TRACK MEMBERS:	TRACK MEMBERS:	TRACK MEMBERS:	TRACK MEMBERS:	TRACK MEMBERS:
Bob Latour (Chair) Jeremy Gilbert Jeoung Soo Lee Ying Mei Alexey Vertegel	Dan Simionescu (Chair) Aggie Simionescu Brian Booth Jeremy Mercuri Naren Vyavahare Ken Webb	Delphine Dean (Chair) Bruce Gao Tong Ye Jordon Gilmore Joseph Singapogu	John DesJardins (Chair) Martine LaBerge Jiro Nagatomi Hai Yao Melinda Harman Will Richardson Yongren Wu	Renee Cottle (Chair) Ann Foley Sarah Harcum Angela Alexander-Bryant David Karig

6. Doctor of Philosophy (PhD program)

6.1 General Information

The Bioengineering comprehensive graduate education leading to the Doctor of Philosophy degree is envisioned to provide the student with knowledge of his or her field of specialization and a mastery of both associated fields and translational research. The degree is not awarded solely on the basis of coursework completed, residence, or other routine requirements. Important bases for granting this degree include a favorable evaluation of the knowledge of the subject matter in the broad field of bioengineering, competence in planning and conducting original research and the ability to communicate adequately and professionally in both oral and written forms. This educational strategy will prepare the student to initiate and participate in research projects developed in industry and academia.

6.2 Specific Regulations

Doctoral work, dealing with intensive study and research, requires dedication and devotion to the subject of inquiry. The desired level of concentration and concern cannot be achieved if the student holds, throughout the period of the study, a full-time job not connected with his or her field of research. For this reason, to receive the Doctor of Philosophy degree, the student must complete a minimum of two semesters of academic work in the doctoral program on the Clemson University, CUBEInC or Clemson-MUSC campus sites.

6.3 Entrance to Doctoral Studies

The student who wishes to embark on a graduate program leading to the Doctor of Philosophy degree in bioengineering must provide evidence of potential for success in advanced graduate study. An M.S. degree is not necessary to enroll in the doctoral program.

During the first two semesters, all newly admitted students meet with their faculty advisor and elect a specialization track (declared in the Track Form). The student's thesis committee will be selected and the Plan of Study (GS2 form) will be developed. Five major tracks that reflect the research interests in the Bioengineering Department are recognized:

- Biomaterials
- Bioelectrical
- Biomechanical
- Regenerative Medicine
- Cellular and Molecular Technologies

The student must pass the departmental doctoral program qualifying examination (4th semester) and the doctoral research proposal defense (6th semester) prior to officially being admitted into the doctoral program. Please refer to Appendix for the table of Deadlines and Timelines).

6.4 Curriculum

Students entering with a BS degree are required to take a total of **60 credit hours**:

24 credit hours of course work (minimum)

- 13 core course credit hours
 - BIOE 8160 (3)
 - BIOE 8460 (3)
 - STAT 8010 (3)
 - Technical Course (BIOE 8010, 8200 or 8700) (3)
 - BIOE 8000 (1)

- 9 additional credit hours of track elective courses
- Up to 2 additional hours of BIOE 8000

36 credit hours of doctoral research (BIOE 9910) (minimum)

Students should consult with their research advisor regarding the technical elective courses offered by the department and applicable to their project. The table below offers a guideline to courses most relevant for each track.

TRACKS – RESEARCH FOCUSED (Recommended Elective Technical Courses)

BIOMATERIALS ENGINEERING	REGENERATIVE MEDICINE	BIOELECTRICAL ENGINEERING	BIOMECHANICAL ENGINEERING	CELLULAR AND MOLECULAR ENGINEERING
<i>TRACK ELECTIVES:</i>	<i>TRACK ELECTIVES:</i>	<i>TRACK ELECTIVES:</i>	<i>TRACK ELECTIVES:</i>	<i>TRACK ELECTIVES:</i>
BIOE 8010 BIOE 8020 BIOE 8200 BIOE 8470 BIOE 6120 BIOE 6230 BIOE 8030 BIOE 8070 BIOE 8240/8241 BIOE 8410 BIOE 8700/8701 BIOE 6820/8820 BIOE 6490/8410 BIOE 8490	BIOE 8010 BIOE 8020 BIOE 8490 BIOE 8730 BIOE 8470 BIOE 6400 BIOE 8410 BIOE 8240/8241 BIOE 8200 BIOE 6120 BIOE 6230 BIOE 8740 BIOE 8750 BIOE 6820	BIOE 6310/6311 BIOE 6350 BIOE 8700/8701 BIOE 6710 BIOE 6450 BIOE 6820/8820 BIOE 6230 BIOE 8620 BIOE 8630 BIOE 8130 BIOE 8140 BIOE 8150 BIOE 8500 BIOE 8600 BIOE 8610 BIOE 8110	BIOE 6120 BIOE 6200 BIOE 6230 BIOE 8010 BIOE 6350 BIOE 6340 BIOE 8200 BIOE 8240 BIOE 8470 BIOE 8490 BIOE 8500 BIOE 6310 BIOE 6450 BIOE 6710 BIOE 6820/8820 BIOE 8200 BIOE 8020 BIOE 8030 BIOE 8110 BIOE 8150 BIOE 8700	BIOE 6400 BIOE 6420 BIOE 6470 BIOE 6490/8410 BIOE 8010 BIOE 8020 BIOE 8030 BIOE 8240 BIOE 8490 BIOE 8500 BIOE 8730 BIOE 6820 BIOE 8820 GEN 8100 BIOL 6030
<i>TRACK MEMBERS:</i>	<i>TRACK MEMBERS:</i>	<i>TRACK MEMBERS:</i>	<i>TRACK MEMBERS:</i>	<i>TRACK MEMBERS:</i>
Bob Latour (Chair) Jeremy Gilbert Jeoung Soo Lee Ying Mei Alexey Vertegel	Dan Simionescu (Chair) Aggie Simionescu Brian Booth Jeremy Mercuri Naren Vyavahare Ken Webb	Delphine Dean (Chair) Bruce Gao Tong Ye Jordon Gilmore Joseph Singapogu	John DesJardins (Chair) Martine LaBerge Jiro Nagatomi Hai Yao Melinda Harman Will Richardson Yongren Wu	Renee Cottle (Chair) Ann Foley Sarah Harcum Angela Alexander-Bryant David Karig

6.5 Professional Development Program (PDP)

Description

In addition to acquiring traditional research and technical skills, bioengineering doctoral students entering the workforce must demonstrate a level of leadership core competencies needed for successful academic and non-academic post-PhD careers.

Through participation in experiential learning, interactive courses, leadership building skills opportunities and individual mentoring, doctoral students will demonstrate confidence and assertiveness in team building, communication, strategic planning, emotional intelligence, project management, budget management, conflict resolution, and entrepreneurship among others. Knowledge of research compliance, regulatory science, globalization, ethics, and equity/inclusion in the workplace is also expected of Clemson BIOE PhD students.

- The program is mandatory for all **full-time students** seeking a PhD in Bioengineering degree.
- The program includes enrollment in mandatory courses (See APPENDIX A – PART 1).
- The program includes a mentored teaching/lab assistant practicum (teaching or grading) and/or CURF internship for a minimum of two semesters after successfully passing the qualifier exam.
- A stipend supplement will be provided each semester for teaching or grader assignment for BIOE undergraduate courses or CURF Internship. The supplement amount will be determined annually based on the nature of the assignment (teaching/lab support, grading, recitation, technology commercialization internship).
- Concurrent enrollment in BIOE 8510 or BIOE 8900 is mandatory while receiving the supplement.
- When students meet eligibility for the supplement (full time, passed qualifier), and will not request a waiver (APPENDIX A), they will submit the application form by the due date (APPENDIX B).
- A program waiver for the practicum or internship, and related activities as listed in PART 1 of APPENDIX A may be requested to the Graduate Committee when endorsed by the advisor of the student. PART 3 must be filled.

The semester before completing their doctoral studies, students will submit the signed PDP check list to their advising committee and the Student Services Coordinator to be cleared for graduation.

6.6 Ph.D. students with M.S. degrees

Requirements are the same as above, but students may transfer no more than one-third of the graded course credit hours when approved by the advising committee as meeting track requirements. Transfer of credits will be approved based on demonstrated equivalent course content and bioengineering context and satisfactory student performance in the transferred course (minimum of “B” grade or higher required). All transfer courses must also be approved by Graduate School.

Please refer to Graduate School policy on transfer credits in the Graduate School Handbook:

<https://www.clemson.edu/graduate/students/policies-procedures/index.html>

6.7 Transfer of Undergraduate credits

Undergraduate coursework may not be transferred for graduate credit. However, completed undergraduate courses that serve to satisfy a deficiency qualify as such only if the student obtained a “B” grade or higher in the course. A “C” grade will be subject to review by the student’s advisor in consultation with the thesis/dissertation committee. A “D” grade or lower will require the student to re-enroll in the course or in equivalent prerequisites, which will not be considered toward minimal graduate credit requirements.

6.8 Summer Enrollment

Students on graduate assistantship are required to enroll for 6 credit hours during the full summer term or summer I and summer II sessions.

6.9 Exceptions or Exclusions

Deviations from the study tracks above will be reviewed and acceptability decided case-by-case by the student's primary research advisor, the student's dissertation committee and the department chair.

6.10 Qualifying Exam and Proposal Defense

The doctoral *qualifying exam* will evaluate the student's ability to think critically and apply knowledge gained from the core courses. It must be taken on the second week of the 4th semester. A PhD student is required to meet with his/her advising committee at the beginning of the 3rd semester to be informed on topics to cover for the qualifier exam. Please refer to Appendix for Rules and Regulations of the Ph.D. Qualifying Exam.

The exam consists of:

1. A critical literature review that identifies the scientific gaps in the field (a 6-7 page minimum, single-spaced document submitted to the Committee a week before the 3rd semester committee meeting).
2. Written exam – answer to 7/12 questions indicated by the advisory committee:
 - 3 questions from a list of 5 questions selected by the committee from the BioE qualifier question bank (to match student's particular plan of study).
 - 4 questions from a list of 7 questions developed by the advisor, based on the topics indicated by the Committee during the committee meeting (to match student's particular research project)

A passing grade is 75%; if students fail the written exam, he/she will be invited to an oral exam. If failed, the student will retake the exam at the next available opportunity. Failure to pass after the second examination will provide grounds for student dismissal from the program.

The *doctoral proposal* defense will evaluate the student's ability to formulate a well-founded hypothesis, develop a research strategy, and conduct experimental/theoretical studies. It must be taken within 2 full academic semesters (fall-spring, spring-fall) following passing of the qualifying exam, in the 6th semester. Please refer to Appendix for Rules and Regulations of the Ph.D. Proposal Exam.

The exam consists of:

1. A proposal document in either NSF www.nsf.gov or NIH www.grants.nih.gov format to the committee at least 10 days prior to the presentation; it must include the specific aims, the project description and strategy, significance, timelines, and references (12-15 pages single-spaced).
2. An oral presentation (30-35 min) in front of the student's thesis committee

After successfully passing the proposal defense, the student is formally admitted as a candidate for the Ph.D. degree. Other policies and procedures established by the Graduate School regarding the Qualifying Exam must be followed. Please refer to the Graduate School webpage to access this information (<https://www.clemson.edu/graduate/students/policies-procedures/index.html>).

6.11 Doctoral Dissertation Defense

For this final examination, the students present the completed dissertation to their Advisory Committee. There must be at least 2 semesters between the Proposal defense exam and the Dissertation defense. At least 10 days prior to the date of defense, the students must submit their final dissertation to the Advisory Committee. The exam consists of a 40-45 min of presentation open to the University committee (a notification of date, time, and location and a summary must be sent to the grad student coordinator 10 days prior to the exam). Questions from the general audience will be followed by questions from the committee related to the dissertation and, occasionally, other components of the student's program as well. In the rare circumstances that a student fails the exam, the committee may grant a second attempt. Failure of the second exam results in dismissal from the program. Guidelines for the thesis/dissertation formats are presented on the Grad School website https://www.clemson.edu/graduate/files/pdfs/etd_guidebook.pdf

7. Assistantships and Financial Assistance

7.1 Assistantships

The basic form of financial aid for graduate students is the graduate assistantship. The customary appointment requires (nominally) 20 hours of work per week outside coursework including BIOE 8910 and BIOE 9910. To maintain a graduate assistantship in the Department of Bioengineering, the student must be continuously enrolled full-time at Clemson University during each term: nine (9) credit hours per semester and six (6) credit hours for the summer. The department does not provide assistantship support for M.S. students or M.Eng. students.

7.2 Graduate Research Assistantship (GRA)

Graduate research assistantships (GRAs) are typically offered by individual faculty members based on need and the availability of funds. All applicants to our doctoral program are considered for available assistantship support opportunities. Specific terms are included in the student's individual offer letter. GRA renewal requires satisfactory progress toward the doctoral degree (as documented in Form 2 and Form 3 of the BIOE Student Evaluation System) and the availability of funds and is at the discretion of the principal investigator.

If a student decides to change the degree sought from Ph.D. to M.S. or M.Eng, the assistantship offer, if any, is automatically terminated.

7.3 Time Capture

The Patient Protection and Affordable Care Act (the ACA), effective March 2010, continues to be implemented in stages. Per guidance from the University's General Counsel, to fully comply with this federal law and to avoid costly penalties, Clemson University has taken action regarding student-paid-work experience. In an ongoing effort to ensure compliance with the Office of Human Resources policies and procedures by graduate student workers, all graduate assistants are required to enter time worked. Human Resources will send you information on how to enter your hours worked in the Time Capture system.

7.4 Fringe Benefits and Medical Care

Fringe benefits such as paid vacations, paid sick leave, health and life insurance programs, etc. are not provided as part of any financial aid. All full time students, however, must participate in the University health plan. The services available in this program are outlined in the Graduate School Website (<https://www.clemson.edu/graduate/students/policies-procedures/index.html>). Also refer to Clemson Student Health Services website for more information on student health insurance plans:

<http://www.clemson.edu/campus-life/student-health/insurance-and-billing.html>

A large part of the mandatory health plan is paid for by Clemson University (Access to after-hours nurse line and Deer Oaks Employee Assistance Plan are just a few benefits.) Please refer to the Clemson Student Health Services website for more information and benefits updates.

7.5 Pay Schedule

U.S. Citizens, Permanent Residents and International Students, remember, you cannot work until all the paperwork is completed and Human Resources approves your hire. The work week is Sunday – Saturday and the pay periods are the 1st – 15th and 16th – 30th/31st. Pay days are the 15th and the last day of the month. Also, students on assistantship are paid on a lag. For example, if a first day of work is August 16th, the first check will be September 15th.

7.6 Tuition and Fees

Tuition will be covered each semester in which you hold a Graduate Assistantship. Graduate Assistants are responsible for the cost of fees and health insurance. Tuition and fees are set by the University Board of Trustees and are subject to change. Detailed information regarding graduate tuition, fees and insurance rates can be found in this page: <https://www.clemson.edu/finance/student-financials/tuition-fees/>. Questions related to the cost of attending should be directed to the Student Financial Services Office.

7.7 Student Financial Services and Paying Your Bill

Student bills are available exclusively online through iRoar. Students are responsible for reviewing and paying their bill in a timely manner. Students can use the [Tuition and Fee Calculator](#) to get an estimate of how much the bill will be. [Information on Adjustment of Academic Fees](#) website has information on how adjustments are processed if a student drops a course, withdraws, etc. Remember to refer to the [Paying Your Bill](#) website to mark your calendar of when bills are due, how to make a payments, how to set up a payment plan and other information that will help you with paying your bill. Questions related to the cost of tuition and related fees should be directed to the [Student Financial Services Office](#).

7.8 Leave and benefits

Graduate students DO NOT accrue paid leave or vacation time. You are expected to work the set number of hours ***throughout the time you are appointed*** except when:

- a) the University is shut down (except where required and described under duties),
- b) your supervisor and you agree to alternate arrangements, or
- c) where HR policies (like Family Medical Leave Act) would require leave.

7.9 Other Financial Assistance

Certain University and industrial fellowships and government traineeships are occasionally available to graduate students. Grants-in-aid and student loans are also available on a limited basis. Specific problems involving financial aid should be discussed with your faculty advisor and the student services coordinator, who will then refer the problem to the appropriate University office.

Refer to the Graduate and Undergraduate Funding Opportunities page on the department's website for additional funding opportunities: <https://www.clemson.edu/cecas/departments/bioe/research/student-funding.html>.

8. General Departmental Regulations

8.1 Ordering of Equipment and Supplies

NO PO, No Pay Policy

<https://www.clemson.edu/procurement/faculty-staff/policies/procurement/No%20PO,%20No%20PAY.html>

P-Card

Order tracking forms are located on the departmental website. Fill the form completely, including account number and justification and obtain your faculty advisor's signature. NOTE: The justification must be a short explanation of why the material is being purchased. Blanket statements like "for general lab use" are not acceptable. Upon faculty approval, take or email the form to Teri Townsend (townsen@clemson.edu) in 301 Rhodes. You must include the account number to be charged. Your order may not exceed \$2,500 (including handling and shipping charges). Any deviations from policies or inappropriate use of the PCARD will result in loss of privileges.

ALL purchases on the PCARD and Buyways MUST be approved by the advisor or Principal Investigator before processing.

buyWays

Any purchase over \$2,500 requires a purchase order. See Michelle Kirby (mlang@clemson.edu) in 301 Rhodes for instructions on how to order items over \$2,500.

See the Academics tab on the departmental website for forms:

<http://www.clemson.edu/cecas/departments/bioe/academics/forms/index.html>

Office Supplies

The department **does not** provide office supplies for students or research teams. Students should check with their advisor if they need supplies.

Work Orders

Orders for work to the machine shop, the physical plant, etc. should be prepared with adequate written descriptions and standard engineering drawings. These should be submitted to the appropriate supervisor or your faculty advisor, who will then see to it that the work order is executed. Forms are available online at: <https://www.clemson.edu/cecas/faculty-staff/documents/MTSWorkrequest.pdf>

8.2 Building Access, Keys and Security

Graduate students will have access to the building after hours by scanning their Tiger ID card/phone in the outside doors' sensors. Graduate students will also be provided with a key or keys for admittance to the pertinent office area and to their assigned work area. Please see Leigh Humphries (lcartee@clemson.edu) in 301 Rhodes (656-1857) for building access, keys and security. Because of the growing security problem on campus, all laboratories and office areas should be locked at the end of the workday.

The campus police, extension 656-2222, should be immediately notified of any suspected breach of security, such as tampered locks, missing items, or the presence of strangers in the office or laboratory areas who cannot account for their presence. The faculty advisor or department chair should also be informed of such occurrences (even during off hours, if the situation appears to warrant it).

*** A fee of \$25 will be charged to replace each lost key.

8.3 Mail

The University mail service is to be used for University-related business only. Your personal mail should be sent to your home. This is especially true of second and third class mail, which overloads not only the mailroom, but also our facilities within the Department.

Student mailboxes, located outside of 105 Rhodes, should be checked at least weekly to facilitate intra-departmental communications.

8.4 Desk Assignment

If available and as a privilege, a desk and storage area will be assigned to graduate students. Each student is responsible for assuring cleanliness of the workspace and the surrounding environment. Lack of responsiveness will result in desk space access/use removal. When you graduate and/or leave the department, you must clean your desk and return the desk key. Follow the Off-Boarding Protocols in the Safety portion of this handbook.

8.5 TigerOne ID Services

The TigerOne ID is the official Clemson University ID for students, employees and affiliates. Review the [TIGERONE](#) website for information on how to obtain and use your ID.

8.6 On-Boarding, Off-Boarding and Safety Regulations

Students who are working/performing research in labs will complete all training necessary for lab access. See the Safety Regulations in this handbook for more information, training and forms to complete.

8.7 Acknowledgement Form

All new students in the Bioengineering Department must return the acknowledgement form (see Appendix) to Trish Nigro (pnigro@clemson.edu), Graduate Student Services Coordinator, within two within two weeks of classes starting.

9. Miscellaneous

9.1 Income Tax

Students should be aware that the State of South Carolina and the federal government levy an income tax. As a general rule, both state and federal income taxes will be withheld from a student's pay, and income tax returns must be filed with both the state and federal tax agencies. Forms may be found online.

9.2 Driver's License and Automobile Registration

Full time students need not become South Carolina residents and need not obtain a S.C. driver's license or South Carolina car registration. If a student does become a S.C. resident, any car must be registered with the state motor vehicle agency within 30 days after taking up residence in the state. A S.C. driver's license must be obtained within 90 days. Each S.C. county has at least one motor vehicle agency. Find locations here <http://www.scdmvonline.com/Locations>.

9.3 Traffic and Parking Regulations

All students and staff are required to register their automobiles with Parking Services, at which time a parking permit/tag will be issued for a fee. Thereafter, the automobile may be parked in one of the appropriate parking areas. Details of the traffic and parking regulations are included in the parking services website: <https://www.clemson.edu/campus-life/parking/>

9.4 Graduate School Academic Regulations

All bioengineering students must review all academic regulations established by the Graduate School. These can be found in the Graduate School Policy Handbook:

<https://www.clemson.edu/graduate/students/policies-procedures/index.html>. Students must be especially aware of policies regarding Academic Integrity.

9.5 Office of Access and Equity

The Office of Access and Equity coordinates the development of policy, procedures, programs and services related to equality of opportunity in employment, business access, admissions, retention, academics, advancement and general treatment for faculty, staff, students and visitors. Access and Equity monitors the University's compliance with all federal, state and University policies related to equitable treatment and unlawful discrimination. Visit the OAE's website for information on training videos and the Graduate Diversity Doctoral Fellowship Award: <https://www.clemson.edu/campus-life/campus-services/access/index.html>

9.6 Clemson University Training Management System

If you are employed by Clemson University, you may be required to complete training in "Information Security Awareness", "Fire Extinguisher Training" and "FERPA Training". When you receive an email from Human Resources to complete a training session, please do so in a timely manner. For more information on required (compliance) and optional training please visit Clemson's Human Resource website: <https://www.clemson.edu/human-resources/talent-and-org-dev/tigertraining.html>.

9.7 Intellectual property terms, research policies and procedures

Ownership of any intellectual property you may produce is governed by the University's IP Policy, found at <http://media.clemson.edu/research/technology-transfer/ip-policy.pdf>

9.8 Immunization Requirements

Students will refer to [Student Medical Services](#) site for information on immunization requirements.

9.9 Health Insurance – mandatory

All graduate students will need to review the information on [Student Health Services: Insurance and Billing](#) page with regards to the mandatory insurance. Contact the Insurance and Billing Office at Redfern Health Center with questions about insurance, billing and/or waivers.

9.10 International Services

International Students with questions about their VISA, I-20 and/or SEVIS check in can review the information on the [International Student Arrival Guide](#). You are also welcome to contact their office with your questions.

9.11 Campus Offices

Most offices on campus operate from 8:00 a.m. till 4:30 p.m. and are closed on the weekends. You can search for various offices on campus from the Clemson University website. The websites will have an area called “Contact Us”. This will give you the phone number and the email address of the office or the person you would need to contact. During this time of transitioning to a new normal, please give departments and employees an opportunity to respond to you and answer any questions you may have. Everyone's goal is to stay safe and follow safety guidelines.

9.12 Social Media

Clemson University Bioengineering

Facebook: Clemson Bioengineering

Instagram: @clemsonbioe

Twitter is @CU_BioE

Clemson University College of Engineering Computing and Applied Sciences (CECAS) Grads

Facebook – Clemson CECAS Grads

Instagram – @cecasgrads

Twitter - @Clemson CECAS Grads

Clemson University Graduate Student Government

Facebook – Clemson Graduate Students

Instagram - @clemsongsg

Twitter - @ClemsonGSG

10. Safety Regulations

10.1 Safety

The conduct of research carries with it an inherent risk of injury and impairment to health. Carelessness can increase this risk to a certainty, while observance of standard safety procedures and precautions can reduce this risk to levels below that of most common occupations. Mandatory safety training is required for all students, staff and faculty in the Department of Bioengineering. Please see Chad McMahan if you have not participated in the departmental safety training or for any other safety concerns.

You are the person responsible for your own safety, as well as the safety of those working with you. Any breach of safety procedures, whether from laziness or inadvertence, will be treated most seriously and will be entered in your record for consideration whenever your overall progress is assessed. Serious lapses can be cause for dismissal.

Do not call CorVel if medical treatment is not needed

CLEMSON UNIVERSITY INJURY PROTOCOL FOR EMERGENCY INJURIES

For workplace injuries requiring emergency treatment, call **911**. Once the employee has been transported, call **CorVel @ 1-866-282-2674**. CorVel will contact the treating facility.

- **CorVel @ (866) 282-2674**. Nurses are available 24 hours a day, 7 days a week.

• **NEW OSHA REGULATIONS**

Effective 1/1/2015:

If an employee is **HOSPITALIZED** due to a work related injury, please call OSHA at **1-800-321-OSHA (6742)** within 24 hours. If a **FATALITY** occurs, please call OSHA within 8 hours at **1-800-321-OSHA (6742)**.

- Call the Office of Risk Management at 864-656-3365

The Medical Surveillance Program (MSP) is the component of Clemson University's Occupational Health and Safety Program, which provides Occupational Health oversight for students and employees with exposure to animals, biological hazards, and certain chemical and physical hazards. The Occupational Health Nurse (OHN) coordinates with the Department of Environmental Health and Safety (EHS), the Animal Research Committee (ARC), the Institutional Biosafety Committee (IBC), animal facilities and other departments and with each enrollee to identify, assess, and manage potential health risks. The Department covers expenses for shots and other related safety issues. Please see Trish Nigro or Chad McMahan for more information. Medical Surveillance enrollment can be done online at:

<https://www.clemson.edu/cbshs/centers-institutes/sullivan/documents/msp/MSP2016.pdf>

NAME: _____

Departmental Survey/Assessment
COMPLIANCE TRAINING

A. I have attended a bioengineering safety seminar led by Chad McMahan and Cassie Gregory in BIOE 8000.

YES NO*

*If you have answered no, you must contact Chad McMahan (clmcmah@clemson.edu) immediately. You will be trained and documentation of your training will be kept on file.

B. I have taken the online training for CHEMICAL HYGIENE by Clemson University Environmental Health and Safety (EHS) at <http://www.clemson.edu/research/safety/training/chem/index.html>

YES DATE PASSED: _____ NO*

*If you have answered no, you must contact Chad McMahan (clmcmah@clemson.edu) immediately. You will be trained and documentation of your training will be kept on file.

C. I have taken the yearly online training for BLOOD BORNE PATHOGENS by Clemson University Environmental Health and Safety (EHS) at <http://www.clemson.edu/research/safety/training/biohazWaste/>

YES DATE PASSED: _____ NO*

*If you have answered no, you must contact Chad McMahan (clmcmah@clemson.edu) immediately. You will be trained and documentation of your training will be kept on file.

D. I have taken the yearly online training for Fire Safety by Clemson University at http://media.clemson.edu/humanres/new_employee/breeze/port_fire_ext/index.htm

YES DATE PASSED: _____ NO*

*If you have answered no, you must contact Chad McMahan (clmcmah@clemson.edu) immediately. You will be trained and documentation of your training will be kept on file.

E. I have successfully completed the Responsible Conduct of Research Training

YES DATE PASSED: _____ NO*

* If you have answered no, you must submit a copy of your certificate of completion within the first month of the start of the semester.

1. On Clemson’s website, seek <http://www.clemson.edu/research/compliance/>.
2. On the left column, select “Responsible Conduct of Research.”
3. And then “Training.” <http://www.clemson.edu/research/compliance/rcr/training.html>.
4. Register using your Clemson username and follow instructions. Under Main Menu, select “Add Course/Update Learner Groups”
5. **At the bottom of the page under “* What area do you need to take a course in?” select “Responsible Conduct of Research (RCR)” –**

You will need to complete the following modules for: Engineering Responsible Conduct of Research (Research misconduct, Authorship, Conflict of Interest, Whistleblowing and the Obligation to Protect the Public)

F. I have taken the online training for BIOHAZARDOUS WASTE MANAGEMENT TRAINING by Clemson University Office of Research Safety

<http://www.clemson.edu/research/safety/hazardouswaste/index.html>

YES DATE PASSED: _____ NO*

*If you have answered no, you must contact Chad McMahan (clmcmah@clemson.edu) immediately. You will be trained and documentation of your training will be kept on file.

G. I have completed the Safety Checklist with my lab manager or PI/researcher/advisor of lab.

1. On the BIOE website: <http://www.clemson.edu/cecas/departments/bioe/academics/forms/index.html>
2. Click on Departmental Forms
3. Click on Safety Information
4. Click on Safety Checklist

YES DATE COMPLETED: _____ NO*

*If you have answered no, you must contact Chad McMahan (clmcmah@clemson.edu) immediately. You will be trained and documentation of your training will be kept on file.

H. I have completed the OSHA Laboratory Policy and is filed in the lab I am working in.

1. On the BIOE website: <http://www.clemson.edu/cecas/departments/bioe/academics/forms/index.html>
2. Click on Departmental Forms
3. Click on Safety Information
4. Click on Safety Checklist

YES DATE COMPLETED: _____ NO*

*If you have answered no, you must contact Chad McMahan (clmcmah@clemson.edu) immediately.

If you find yourself having to work alone in the lab, please notify your supervisor when you arrive in the lab and when you leave the lab.

Appendix

DEPARTMENT OF BIOENGINEERING GRADUATE STUDENT EVALUATION FORM

Part 1: Goals

Date: _____ Semester/Year: _____

Student: _____ Year in Program: _____

Degree Sought (Circle One): MS Thesis MS Non-Thesis PhD

Advisor _____ Co-Advisor: _____

(if applicable)

Part 1 is to be completed at the beginning of each semester and will be filed in the student's file within the first month of the semester.

A. Research and Scholarship (research ability and lab skill enhancement, scholarship and award proposal development, peer-reviewed manuscripts and conference proceeding submissions, conferences and seminar presentation)

B. Coursework / Fulfillment of Degree Requirements:

C. Assigned Job (Circle One)

20 Hours Department

20 Hours Advisor

10 / 10 Department / Advisor

Scholarship

D. Elected Office (if applicable)

Student Signature: _____

Date: _____

Advisor Signature: _____

Date: _____

DEPARTMENT OF BIOENGINEERING GRADUATE STUDENT EVALUATION FORM

Part 2: Self-Evaluation

Please provide any general comments regarding your performance and accomplishments during this evaluation period and on specific strengths and weaknesses:

Student Signature: _____

Date: _____

Advisor Signature: _____

Date: _____

DEPARTMENT OF BIOENGINEERING GRADUATE STUDENT EVALUATION FORM

Part 3: Advisor Evaluation

Overall Grade (please circle only one letter grade):

P

F

Please provide any general comments regarding the student's performance and accomplishments during this evaluation period and on specific strengths and weaknesses.

I have read and discussed the content of this evaluation with my advisor

Student Signature: _____

Date: _____

Advisor Signature: _____

Date: _____

Supervisor for
assigned Job (if applicable): _____

Date: _____

DEPARTMENT OF BIOENGINEERING GRADUATE STUDENT EVALUATION FORM

Part 4: Guidelines*

Goals	Evaluation Metrics
Development of Independence	<ol style="list-style-type: none"> 1. Show initiative in planning long-term goals, monitoring progress and in disseminating findings 2. Design experiments (with a weekly written plan) and complete them independently 3. Identify research questions timely and determine several ways to address them independently 4. Revisit / reevaluate experimental protocols if the obtained data have large variability, troubleshooting lab equipment, calling up technical support, etc.
Lab Leadership / Responsibility	<ol style="list-style-type: none"> 1. Set a high standard for the quality of research performed in the lab (reliable data generations, presentation skills, lab management) 2. Maintain lab in safe condition and follow safety guidelines 3. Keep the lab neat, uncontaminated and in aesthetically pleasing condition 4. Grasp the overall lab operation, delegate tasks amongst members and train other students in techniques 5. Maintain, with venders, lab equipment and other facilities in good condition, keep logbooks, and track inventory requirements 6. Practice teamwork-Take initiative in assisting other students in research and written/ oral communication
Efforts to Grasp New Concepts	<ol style="list-style-type: none"> 1. Discuss at least one new idea per month with advisor 2. Read manuscripts in various research areas and propose its application regularly during lab meeting/ journal clubs
Knowledge of Relevant Literature	<ol style="list-style-type: none"> 1. Read at least 10 new papers per month in the area of research 2. Evaluate and compare the merits and drawbacks of published work and own research 3. Modify or improve research goals/plans constantly in terms of recent literature 4. Establish collaborative contacts with assistance from advisor/ faculty
Originality, Intellectual Creativity in Research	<ol style="list-style-type: none"> 1. Contribute original ideas to research projects and/or PI' s proposals 2. Suggest valid modifications of research aims digressing from what advisor originally proposed 3. Adapt, alter, or refine established scientific methods or techniques not having been used in the lab to achieve current research goals. 4. Develop new techniques with considerations of financial allowance, equipment availability, and with advisor's agreement
Efforts Devoted to Quantitative Thought during Research	<ol style="list-style-type: none"> 1. Determine analytically, theoretically or experimentally parameters involved in research, being able to employ mathematical tools such as differential equations 2. Analyze, statistically, experimental outcomes and interpret their relevance 3. Identify parameters influencing experimental or modeling outcomes and develop solutions to reducing error margins
Work Habits in Pursuit of Research Goals	<ol style="list-style-type: none"> 1. Demonstrate consistent work ethic / habits, such as following lab rules for work hours 2. Schedule vacation in advance and consistent with lab and University policy 3. Find positive / alternatives for negative results

DEPARTMENT OF BIOENGINEERING GRADUATE STUDENT EVALUATION FORM

Part 4: Guidelines*

Goals	Evaluation Metrics
Improvements in Lab Skill	<ol style="list-style-type: none"> 1. Know precisely how all methods work 2. Know how to operate and maintain all lab instruments, even if they are not directly used for your research 3. Try to know how to operate and understand the theory behind the instruments available in the Department / University, such as SEM 4. Obtain consistent results from one experiment to the other one with minimal personal error
Productivity in Research	<ol style="list-style-type: none"> 1. Submit at least one conference abstracts per year on average during the graduate study period 2. Submit at least one full length peer-reviewed research publication per year after passing qualifying exam (Minimum 3 during Ph.D. study) 3. All submissions must be approved by advisor and co-authors
Written Communication Skills	<ol style="list-style-type: none"> 1. Write on average one original document (summary, proposal, protocol etc.) per month with minimal supervision.
Oral Communication Skills	<ol style="list-style-type: none"> 1. Present research work in at least one conference per year 2. Improve overall scores obtained from departmental graduate seminar 3. Discuss in the lab meeting on the presentation skills used by the invited speakers during the Friday departmental seminar
Course Study/ Degree Progress	<ol style="list-style-type: none"> 1. Maintain 3.5 GPA in course work 2. Take courses that would improve either current research function or future career development 3. Schedule one committee meeting per semester 4. Complete necessary degree requirements consistent with departmental timelines (GS-2, qualifying exam, etc.)
Assigned Job (if applicable, Evaluation conducted by assigned supervisor)	

** These guidelines are established for doctoral students who have completed their first year of graduate school. First year PhD or MS students should use these metrics as targeted performance goals.*

BIOE GRADUATE TASKS/CHECKLIST

TIMELINE	ACTION ITEM	SUBMIT TO	STUDENT	ADVISOR	COMMITTEE
Enrollment	Meet with advisor and declare track (TRACK FORM)	Grad student coordinator	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
1 st semester	Evaluation Part 1 (FORM 1)	Grad student coordinator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 st semester	Committee selection	IROAR	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2 nd semester	Plan of study (FORM GS2)	IROAR	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3 rd semester	Start Preparing for Qualifier exam: Critical literature review (send to committee 1 week prior to committee meeting)	Committee	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3 rd semester	Committee meeting – student advised about topics needed to cover for Qualifier exam (add to TRACK FORM)	Grad student coordinator & Committee	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3 rd semester	Selection of questions for qualifier: 5 from database, 7 related to research project	Grad student coordinator	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4th semester	Written Qualifier Exam Respond to 3/5 + 4/7 questions	Grad student coordinator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 th semester	Grade questions (2 weeks)	Grad student coordinator	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4 th semester	Oral qualifier exam (if needed)	Grad student coordinator	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6 th semester	Preparing for Proposal exam: send Document to committee – 10 days prior to exam	Committee	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6th semester	Proposal Defense		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6 th semester	Submit Comprehensive exam form (GS5)	Grad student coordinator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Last semester	Preparing for Dissertation Defense: send defense notice 10 days prior to exam:	Grad student coordinator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Last semester	Also 10 days prior to Dissertation Defense send thesis to committee	Committee	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Last semester	Final Dissertation Defense		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Last semester	Dissertation Defense results (FORM GS7)	Grad student coordinator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Last semester	Apply for Graduation	IROAR	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Last semester	Upload Dissertation - Formatting Review	Grad School Manuscript Office	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Last semester	Upload final approved manuscript	Grad School Manuscript Office	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
End of each semester	Evaluation Part 2 (FORM 2 – student, FORM 3 – advisor)	Grad student coordinator	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

- Graduate Students must **schedule committee meetings every semester** and prior to major events such as qualifier exam, proposal defense and final dissertation defense to keep committee informed of plans and research progress.

- To the **first committee meeting (early 3rd semester)**, the student should bring the **TRACK FORM and the GS2 FORM** and briefly (10-15 mins) introduce the project to the committee, verbally or using 2-3 slides (no need to include aims, details, or a timeline, which are part of the proposal document and presentation). The committee members advise the student about general and project-specific topics to study in order to answer to the qualifier exam questions and competently execute the project. The committee should direct the student to specific sources that cover those topics, such as pertinent class material, book chapters, and review papers.

- Graduate School Deadlines: <http://www.clemson.edu/graduate/students/deadlines.html>



**BIOENGINEERING Ph.D.
TRACK FORM for QUALIFIER EXAM**

Student name: _____

Enrollment date: _____

Track(s) selected: _____

Committee members (3rd semester): _____

Qualifier topics and sources to study (class material, books, reviews):

Advisor name and signature: _____

Date: _____

Date of committee meeting: _____

Date: _____

BIOENGINEERING Ph.D. QUALIFIER EXAM

TRACK SELECTION – MORE THAN ONE TRACK CAN BE SELECTED (WITH HELP OF ADVISOR AND ADVISING COMMITTEE)

- Biomaterials
 - Bioelectrical
 - Biomechanics
 - Regenerative Medicine
 - Cellular and Molecular Engineering Technologies
-

QUALIFIER EXAM DATE (QUALIFIER MUST BE TAKEN NO LATER THAN ONE AND A HALF YEAR AFTER Ph.D PROGRAM ENROLLMENT)

- Fall semester –second week after beginning of classes (Friday 1:00-4:30PM)
 - Spring semester – second week after beginning of classes (Friday 1:00-4:30PM)
-

QUALIFIER EXAM FORMAT AND GRADING

1. Student should meet with his/her advising committee no more than six months after enrollment (at least 3 months before qualifier exam) to be informed on topics to cover (general and project-specific) for qualifier exam.
 2. A week before the above meeting, student should submit to the academic committee a critical literature review that identifies the scientific gaps in the field (6-7 pages minimum, single-spaced document)
 3. Written exam consists of answer to 7 questions that will evaluate the student's ability to think critically and apply knowledge gained from the core track courses.
 - a. 3 questions (from a list of 5) from selected scientific track(s),
 - b. 4 questions (from a list of 7) related to the student's research project (questions developed by the advisor).
 4. Exam is administered and graded by appropriate faculty members.
 5. Grades are returned to the advisor who will communicate them to the student.
 6. Passing grade is 75% or higher; if lower, a list of deficiencies is forwarded to the student. Graded exam is not returned to the student. The student can be invited to an oral exam. If a student fails the written and oral part of the examination, he or she will be provided a second and final chance to retake the qualifier exam on the next available opportunity.
 7. Failure to pass all components of the qualifying examination after the second examination attempt will provide grounds for the student to be dismissed from the doctoral program at the end of the academic term during which the examination was administered.
-

ORAL EXAM (IF NEEDED)

The oral exam is administered by a committee made up of 3 or more faculty members: student's advisor (or committee member appointed by advisor) and appropriate other faculty members.

Other Clemson faculty members could also be invited (ad hoc) to cover specific expertise in which deficiencies were found as needed (statistics, etc.)

Exam is administered no later than one month after receiving the list of deficiencies.

Examiners will use a rubric developed by the department for grading. Grading is pass, fail, or conditional pass with condition(s) specified by the oral examination committee.

DEPARTMENT OF BIOENGINEERING GUIDELINE FOR Ph.D. PROPOSAL DEFENSE

Requirements

- The doctoral proposal defense must be taken within 2 full academic semesters (fall-spring, spring-fall) after passing the qualifying exam. The proposal defense consists of 1) 35-45 min + Q+A oral presentation and defense in front of the student's thesis committee and 2) submission of the proposal document in either NSF or NIH format, (see below) to the committee at least 10 days prior to the presentation. If student fails the candidacy exam, he/she will be given one more chance to take it within one semester. If student fails the second time, he/she will switch to MS (form GS-14) and graduate within one semester.

NSF format www.nsf.gov for latest version NSF PAPPG

NIH format www.grants.nih.gov for latest version

NIH format (http://grants.nih.gov/grants/funding/424/SF424_RR_Guide_General_Adobe_VerB.pdf).

- The proposal document must include the following sections:
 - Project Summary (NSF) / Specific Aims (NIH) (1 single-spaced page)
 - Project Description (NSF) / Research Strategy (NIH) (12 - 15 single-spaced pages including figures)
 - References (single list of <100 articles)
- Although the exact format of the oral presentation may be determined by the student and advisor, it **must demonstrate**:
 - Critical evaluation of the current literature pertinent to the student's research project (advanced knowledge and opinion)
 - Evidence of having conducted experimental / theoretical study and communicated the findings and interpretation (applied research principles)
 - Ability to form a well-founded hypothesis and construct an approach plan to test the hypothesis to advance knowledge (pragmatic envisioning skills)
- Upon passing of the proposal defense the student must submit the following to the Graduate Student Services Coordinator for departmental file:
 1. Signed GS-5D form: (<https://www.clemson.edu/graduate/files/pdfs/GS5D.pdf>)
 2. Signed GS-Research Approval form: (<https://www.clemson.edu/graduate/students/forms.html>)
 3. Assessment forms completed by the advisor:
<https://www.clemson.edu/cecas/departments/bioe/documents/proposal-exam-assessment-form.pdf>

PROPOSAL EXAM ASSESSMENT

Student Name: _____

Part 1: Written Proposal

1. Signed GS2? Yes _____ No _____

Does committee include someone from outside the Bioengineering department? _____

If so, from which department/institution is the committee member: _____

2. Which format is the proposal in? NSF _____ NIH _____

Will this actually be submitted to a funding agency? If so, where? _____

3. Overall Assessment of written document:

	Excellent (5)	Very Good (4)	Good (3)	Fair (2)	Poor (1)
Pragmatic Envisioning Skills	Has a well-founded and clearly stated hypothesis or overall project goal.	Has a well-founded hypothesis/goal. Could be stated earlier or more clearly in the document.	Has a hypothesis/goal. Motivation not very clear and/or statement is not clear.	Some attempt at hypothesis/goal statement. Not clearly stated and/or the motivation lacking.	No defined hypothesis or goal is stated in the proposal
Comments:					
Critical evaluation of literature (advanced knowledge)	Demonstrates critical evaluation the current state of literature. Multiple research groups properly cited clear description of the works which motivates the reasoning for the proposed work.	Demonstrates critical evaluation the current state of literature. Multiple research groups properly cited, most works are clearly described which motivates the reasoning for the proposed work.	Describes prior work. Properly cites multiple research groups. However, connection to current work is not always clear.	Describes prior work. Some key results are missing or results from only a few groups are mentioned. Connection to current work is not always clear.	Lacks a good description of prior work. Key results are missing or results from only a few groups are mentioned. Connection to current work is not clear.
Comments:					
Applied research principles	Preliminary results well described and interpreted, show capability and proof-of-concept, support goal. Methods for future experiments clearly described; describe alternate approaches to ensure success. Includes a timeline for overall project.	Preliminary results well described and interpreted, show capability and proof-of-concept. Includes timeline for project. Future experiments are sketched out and good in concept.	Includes some description of preliminary results, timeline, and future experiments. Methods could be clearer.	Includes a timeline and descriptions of future experiment. Few initial results presented. Methods are missing details.	Missing timeline, initial results and/or future experiment descriptions. Methods descriptions are hard to follow.
Comments:					

	Excellent (5)	Very Good (4)	Good (3)	Fair (2)	Poor (1)
Writing skills	Has distinct proposal structure with clearly defined sections. Coherent sentences. Clear aims/goals. Proposal is well motivated and has the potential to get funded.	Has distinct proposal structure with clearly defined sections. Coherent sentences. Clear aims/goals. Well motivated.	Clearly defined sections. Coherent sentences and clear aims/goals. Could improve writing to help “sell” idea to reviewer.	Some spelling or grammar errors. Some structure but could be clearer.	Very hard to read or follow. Sections are not clearly defined.
Comments:					

Advisor Initials: _____ Committee Initials: _____

Part 2: Proposal Exam Presentation Assessment

	Excellent (5)	Very Good (4)	Good (3)	Fair (2)	Poor (1)
Pragmatic Envisioning Skills	Has a well-founded and clearly stated hypothesis or overall project goal.	Has a well-founded hypothesis/goal. Could be stated earlier or more clearly in the document.	Has a hypothesis / goal. Motivation not very clear and/or statement is not clear.	Some attempt at hypothesis / goal statement. Not clearly stated and/or the motivation lacking.	No defined hypothesis or goal is stated in the proposal.
Comments:					
Critical evaluation of literature (advanced knowledge)	Demonstrates critical evaluation the current state of literature. Multiple research groups properly cited clear description of the works which motivates the reasoning for the proposed work.	Demonstrates critical evaluation the current state of literature. Multiple research groups properly cited. Most works are clearly described which motivates the reasoning for the proposed work.	Describes prior work. Properly cites multiple research groups. However, connection to current work is not always clear.	Describes prior work. Some key results are missing or results from only a few groups are mentioned. Connection to current work is not always clear.	Lacks a good description of prior work. Key results are missing or results from only a few groups are mentioned. Connection to current work is not clear.
Comments:					
Applied research principles	Preliminary results well described and interpreted, show capability and proof-of-concept, support goal. Methods for future experiments clearly described; describe alternate approaches to ensure success. Includes a timeline for overall project.	Preliminary results well described and interpreted, show capability and proof-of-concept. Includes timeline for project. Future experiments are sketched out and good in concept.	Includes some description of preliminary results, timeline, and future experiments. Methods could be clearer.	Includes a timeline and descriptions of future experiment. Few initial results presented. Methods are missing details.	Missing timeline, initial results and/or future experiment descriptions. Methods descriptions are hard to follow.
Comments:					
Oral presentation skills	Is clear and precise in oral presentations. Is comfortable answering audience questions.	Is clear and precise in oral presentations.	Presents in understandable manner.	Lacks confidence / somewhat hard to follow.	Presentation very hard to follow or understand.
Comments:					

Advisor Initials: _____ Committee Initials: _____

APPENDIX A
CHECK LIST – PDP Program
(To be returned the semester before graduation)

PART 1

Mandatory courses/activities Check List:	DATE COMPLETED
<input type="checkbox"/> BIOE 8000 – Seminar in Bioengineering Research (mandatory enrollment during degree program – only waived for TA or course conflict)	
<input type="checkbox"/> BIOE 8160 – Bioengineering Career Professional Development	
<input type="checkbox"/> TA training provided by CECAS or other (must be completed for teaching or grading assignment) OR CURF Intern (separate application process) ¹	
<input type="checkbox"/> BIOE 8510 – Mentoring Undergraduates (concurrent enrollment when receiving stipend supplement for teaching or grading work)#	
<input type="checkbox"/> BIOE 8900 – Internship (concurrent enrollment when receiving stipend supplement as CURF Intern)	
<input type="checkbox"/> Enrollment in Clemson GRAD360° (https://grad360.sites.clemson.edu/)	

¹Qualifier exam must be successfully passed; assignment priority based on seniority

PART 1

Other encouraged activities (check all that apply – provide description below with dates):
<input type="checkbox"/> Journal Club participation <input type="checkbox"/> Leadership roles in CBO, BMES Student Chapter, SFB Student Chapter, other <input type="checkbox"/> Participation in GSG or MUSC Student Government <input type="checkbox"/> Development of new student oriented programs <input type="checkbox"/> Mentor of undergraduate research assistants (BIOE 2910/4910) and Creative Inquiry teams (BIOE 4510) <input type="checkbox"/> Other proposed activities by student and approved by advisor
Description:

PART 3

Waiver request for the practicum or internship, and related activities (Provide justification)

Student Signature Student NAME/CUID

PhD Degree Start Date PhD Graduation Date

PhD ADVISOR Signature PhD ADVISOR Name

Course Instructor Signature (if Teaching/Grading Supplement) Course Instructor Name

CURF Signature (if CURF Internship) CURF Name (CURF Internship)

ADOPTED Bioengineering Faculty November 20, 2020.

APPENDIX B

Professional Development Program (PDP) for Doctoral Students

2021-22 GRA SUPPLEMENT APPLICATION FORM

DUE ELECTRONICALLY BY MAY 15, 2021 (pnigro@clemson.edu)

Name: _____

Advisor Name: _____

Date of Program Enrollment

Anticipated Graduation Date

Primary campus location (select one): Clemson Greenville Charleston

Date you passed the Qualifier Exam: _____

Supplement Preference (select all applicable): Teaching* Grading* CURF Internship**

Applicant Signature

Date

Advisor Signature

Date

For Teaching and Grading Supplement, provide a list of teaching and/or mentoring experience with dates (e.g. CI, Honors Research, Undergraduate Research, BIOE 4510, BIOE 4910, PEER/WISE, Gen Eng, ASC, etc.)

For CURF Internship Supplement, provide a list of past applicable experience, interest and career plans (see program announcement on page 5). CURF Internship requires a separate application to be submitted by June 1, 2021 to Brittany Souto (bsouto@clemson.edu) (see Appendix C for information needed in application package). CURF Interns will be selected by CURF.

*Requires concurrent enrollment in BIOE 8510 (section of instructor of record of assigned teaching/grading duties)

**Requires concurrent enrollment in BIOE 8900 Internship

APPENDIX C

CLEMSON UNIVERSITY RESEARCH FOUNDATION (CURF) TECHNOLOGY COMMERCIALIZATION INTERNSHIP OPPORTUNITY ANNOUNCEMENT

Academic Year 2021-2022

CURF is seeking graduate students in science and engineering disciplines who desire to learn about technology commercialization by working at the Clemson University Research Foundation (CURF). CURF is responsible for managing the intellectual property of Clemson University by soliciting and analyzing invention disclosures for commercial potential, patenting selected inventions, and marketing and licensing technologies to third parties. Students will receive hands-on experience learning how ideas generated in a research laboratory can be developed into commercial products. This Internship experience provides a great opportunity for graduate students who are interested in exploring career opportunities which require a cross-disciplinary skill set in business, legal and scientific technical fields.

The internship is a year-round opportunity for up to 28 hours a week.

Academic Technology Commercialization or “Technology Transfer” involves understanding intellectual property and the methods for evaluating, marketing, and commercializing nascent technologies. CURF Interns will support CURF’s technology commercialization activities in the following ways:

1) INTELLECTUAL PROPERTY MANAGEMENT: The Intern will help to identify, evaluate, and protect University IP through the patenting process.

2) TECHNOLOGY MARKETING: The Intern will:

- support tech commercialization officers through ad hoc market data collection for incorporation into technology commercialization evaluations;
- support the development of marketing descriptions and materials in the Clemson University IP portfolio;
- perform early stage market opportunity evaluations for technologies and develop his/her own assessment of the market viability of specific technologies; and,
- support marketing events, which may include working with tech commercialization officers to develop and deliver presentations featuring key technologies at industry events.

3) TECHNOLOGY COMMERCIALIZATION: The Intern may interact with external companies and startup ventures during contractual transactions, which may include business development activities, comparable transactional analysis, and technology valuations.

Given the nature and responsibilities of the position, only US persons (any individual who is a citizen of the United States, a permanent resident alien of the United States, or a protected individual as defined by 8 U.S.C.1324b(a)(3)) will be considered for this position.

INTERESTED APPLICANTS SHOULD SUBMIT A LETTER OF APPLICATION EXPLAINING YOUR INTEREST AND A CURRENT CV TO BRITTANY SOUTO AT bsouto@clemson.edu. THIS IS A PAID POSITION REQUIRING A MINIMUM OF 10-12 HOURS PER WEEK. IF YOU ARE CURRENTLY ON AN ASSISTANTSHIP OF 20 HOURS AND WISH TO SUPPLEMENT YOUR ASSISTANTSHIP, PERMISSION FROM YOUR GRADUATE ADVISOR IS REQUIRED.

APPLICATION DEADLINE: June 1, 2021

BIOENGINEERING MS THESIS/PROJECT ASSESSMENT

Candidate Name: _____

M.S. Thesis / M.S. Non-thesis _____

Title of Thesis / Project: _____

Defense Date: _____

Advisor Name: _____

Committee Member Names: _____

Do you have a committee member from an external department or field? _____

Committee Members' Department(s)/Field(s): _____

Have you been a co-author for a journal paper or conference proceeding, or co-inventor on a patent with someone from a department or field other than Bioengineering? _____

Collaborators Department(s)/Field(s): _____

Number of Papers published or currently under review: _____

Number of Papers in preparation: _____

Number of Patents applied for or approved: _____

Number of undergrads mentored: _____

Number of K-12 students or teachers mentored: _____

Professional Society Memberships: _____

Number of Awards or Fellowships received since enrolling in PhD/MS program: _____

Please attach your CV (see template on webpage) _____

Update Address: _____

Update Email: _____

Position: _____

Company: _____

Location: _____

Part 1: Written Thesis/Project Document Assessment

(Can be completed by advisor and committee **before** oral defense)

	Excellent (5)	Very Good (4)	Good (3)	Fair (2)	Poor (1)
Knowledge of field	Covers key articles in the field; Uses literature to help make points in presentation and answer questions; critically evaluates the current state of literature suggest follow-on studies based on a body of work.	Covers key articles in the field. Can use literature to help make points in presentation and answer questions.	Covers some key articles. Uses findings from literature to help make points.	Covers a few articles but misses some key major literature results.	Missing citations. Does not know most of the key works in the field. Misrepresents other's work.
Comments:					
Work ethic	Is in lab when expected. Excels both in class and in the lab. Goes above what is expected.	In lab when expected; Finishes work on time. Does well both in class and in the lab.	In lab when expected; works hard on project but sometime late.	Not always in lab; work gets done but sometimes late.	Not always in lab; work is not completed as expected.
Comments:					
Writing skills	Has distinct structure with clearly defined sections. Coherent sentences. Clear aims/goals. Document is well motivated and has the potential to get published.	Has distinct structure with clearly defined sections. Coherent sentences. Clear aims/goals. Well motivated.	Clearly defined sections. Coherent sentences and clear aims/goals. Could improve writing to help "sell" idea to reviewer.	Some spelling or grammar errors. Some structure but could be clearer.	Very hard to read or follow. Sections are not clearly defined.
Comments:					

Advisor Sign Off on Lab Skills

(Requirement for students who started after May 2012 to ensure non-thesis students have met lab skills requirement):

Does the MS project have a significant lab component? YES _____ NO _____

If NO, has the student taken a class with a lab component? (which one?)

BioE6350 BioE8020 BioE8110 BioE8240 BioE8700 Other: _____

Part 2: Oral Defense Presentation Assessment

	Excellent (5)	Very Good (4)	Good (3)	Fair (2)	Poor (1)
Knowledge of field	Remembers key articles in the field; Can use literature to help make points in presentation and answer questions; Can critically evaluate the current state of literature suggest follow-on studies based on a body of work.	Remembers key articles in the field. Can use literature to help make points in presentation and answer questions.	Remembers some key articles. Occasionally remembers content paper but not author/year. Uses findings from literature to help make points.	Knows a few articles but misses some key major literature results. Cannot remember author/year for articles. Has trouble remembering papers for use in presentation.	Missing citations. Does not know most of the key works in the field. Misrepresents other's work.
Comments:					
Critical thinking skills	Can think on his/her feet; points out gaps in knowledge or problems with existing technology; uses quantitative reasoning to answer questions.	Points out gaps in knowledge or problems with existing technology.	Can point out issues in tech/knowledge after some hints from committee.	Cannot independently point out gaps/problems in field. However, understands points made by committee.	Lacks fundamental critical thinking skills when responding to committee.
Comments:					
Breadth of knowledge	Answers committee questions by using advanced concepts from many areas of bioengineering.	Answers committee questions using fundamentals from across BioE.	Has demonstrated solid background in many areas of BioE but has some weaker areas from BioE.	Weak in several key areas of BioE fundamental to the field.	Shows lack of fundamentals across most of the field.
Comments:					
Oral communication	Is clear and precise in oral presentations. Is comfortable answering audience questions.	Is clear and precise in oral presentations.	Presents in understandable manner.	Lacks confidence / somewhat hard to follow.	Presentation very hard to follow or understand.
Comments:					

BIOENGINEERING Ph.D. DISSERTATION DEFENSE ASSESSMENT FORM

Candidate Name: _____

Facilities visited during program:

CUBEInC, CU Rhodes/Rhodes Annex, CU BRC, CU-MUSC, AMRL, CLIF, others (list)

Title of Thesis/Dissertation: _____

Defense Date: _____

Advisor Name: _____

Committee Member Names: _____

Do you have a committee member from an external department or field? _____

Committee Members' Department(s)/Field(s): _____

Have you been a co-author for a journal paper or conference proceeding, or co-inventor on a patent with someone from a department or field other than Bioengineering? _____

Collaborators Department(s)/Field(s): _____

Number of Papers published or currently under review: _____

Number of Papers in preparation: _____

Number of Patents applied for or approved: _____

Number of undergrads mentored: _____

Number of K-12 students or teachers mentored: _____

Professional Society Memberships: _____

Number of Awards or Fellowships received since enrolling in PhD/MS program: _____

Please attach your CV (see template on webpage)

Updated Address: _____

Updated Email: _____

Updated Position: _____

Company: _____

Location: _____

Part 1: Written Dissertation Document Assessment

(This pre-defense form can be filled out by advisor **before** oral defense)

	Excellent (5)	Very Good (4)	Good (3)	Fair (2)	Poor (1)
Knowledge of field	Covers key articles in the field; Uses literature to help make points in presentation and answer questions; critically evaluates the current state of literature suggest follow-on studies based on a body of work.	Covers key articles in the field. Can use literature to help make points in presentation and answer questions.	Covers some key articles. Uses findings from literature to help make points.	Covers a few articles but misses some key major literature results.	Missing citations. Does not know most of the key works in the field. Misrepresents other's work.
Comments:					
Work ethic	Is in lab when expected. Excels both in class and in the lab. Goes above what is expected.	In lab when expected; Finishes work on time. Does well both in class and in the lab.	In lab when expected; works hard on project but sometime late.	Not always in lab; work gets done but sometimes late.	Not always in lab; work is not completed as expected.
Comments:					
Writing skills	Has distinct structure with clearly defined sections. Coherent sentences. Clear aims/goals. Dissertation is well motivated and has the potential to get published.	Has distinct structure with clearly defined sections. Coherent sentences. Clear aims/goals. Well motivated.	Clearly defined sections. Coherent sentences and clear aims/goals. Could improve writing to help "sell" idea to reviewer.	Some spelling or grammar errors. Some structure but could be clearer.	Very hard to read or follow. Sections are not clearly defined.
Comments:					

Part 2: Oral Presentation Assessment

	Excellent (5)	Very Good (4)	Good (3)	Fair (2)	Poor (1)
Knowledge of field	Remembers key articles in the field; Can use literature to help make points in presentation and answer questions; Can critically evaluate the current state of literature suggest follow-on studies based on a body of work.	Remembers key articles in the field. Can use literature to help make points in presentation and answer questions.	Remembers some key articles. Occasionally remembers content paper but not author/year. Uses findings from literature to help make points.	Knows a few articles but misses some key major literature results. Cannot remember author/year for articles. Has trouble remembering papers for use in presentation.	Missing citations. Does not know most of the key works in the field. Misrepresents other's work.
Comments:					
Critical thinking skills	Can think on his/her feet; points out gaps in knowledge or problems with existing technology; uses quantitative reasoning to answer questions.	Points out gaps in knowledge or problems with existing technology.	Can point out issues in tech/knowledge after some hints from committee.	Cannot independently point out gaps/problems in field. However, understands points made by committee.	Lacks fundamental critical thinking skills when responding to committee.
Comments:					
Breadth of knowledge	Answers committee questions by using advanced concepts from many areas of bioengineering.	Answers committee questions using fundamentals from across BIOE.	Has demonstrated solid background in many areas of BioE but has some weaker areas from BIOE.	Weak in several key areas of BioE fundamental to the field.	Shows lack of fundamentals across most of the field.
Comments:					
Oral communication	Is clear and precise in oral presentations. Is comfortable answering audience questions.	Is clear and precise in oral presentations.	Presents in understandable manner.	Lacks confidence / somewhat hard to follow.	Presentation very hard to follow or understand.
Comments:					

CLEMSON UNIVERSITY BIOENGINEERING ON-BOARDING GRADUATE STUDENT CHECKLIST

Name: _____

Phone: _____

Alternate Phone: _____

Job Title: _____

Building(s) to be occupied (Check applicable):

Patewood MUSC-BEB Rhodes Facility Rhodes Annex

WELCOME to BIOENGINEERING

We welcome you on behalf of the students, faculty, and staff. Your accomplishments have set you at a caliber above and beyond the standards of performance. Please complete the form below as a process of you on-boarding. You are an asset to CECAS, TEAM-BIOE, and Clemson University.

On-Boarding Checklist

Safety Information for Students on the Clemson Campus

Policies, Training Reports, Checklist and Safety Protocols can be found on the Department's website

<https://www.clemson.edu/cecas/departments/bioe/academics/forms/index.html>

Safety Information for Students on the MUSC Campus is provided by MUSC.

Checklist	Grad. Stud. Electronic Initials
Graduate Coordinator – Trish Nigro	
Lab Compliance, Safety, Injury Reporting – Chad McMahan	
Project Approvals and IACUC – Cassie Gregory	

Signature:

The University Policies concerning the items have been explained to me. I understand the information provided and will follow the policies and procedures as required.

Graduate Student: _____

Date: _____

The completed On-boarding Graduate Student checklist will be returned to Trish Nigro.

FACULTY/STAFF CONTACT:

Dr. Martine LaBerge - BIOE Department Chair, Faculty – lberge@clemsn.edu - 864-656-5557

Teri Townsend - Executive Assistant to Chair – townsen@clemsn.edu - 864-656-5556

Teri Townsend - Administrative Documents and Human Resources (payroll)

Leigh Humphries – Admin. Coord. (travel/keys) – lcartee@clemsn.edu - 864-656-1857

Michelle Kirby – Accountant and Fiscal Analyst – mlang@clemsn.edu - 864-656-5561

Katie Jennings – Financial Technician – knjenni@clemsn.edu - 864-656-1788

Janeen Putman – Undergraduate Student Services – janeen@clemsn.edu - 864-656-0308

Tammy Rothell – Undergraduate Coordinator – tammy@clemsn.edu - 864-656-5556

Trish Nigro – Graduate Student Services – pnigro@clemsn.edu - 864-656-7276

Jenny Bourne – Editing and Teaching Proposals – jbourne@clemsn.edu - 864-656-1737

Anna Craft – Media Coordinator – akcraft@clemsn.edu - 864-656-3051

Olga Reukova – Publication Director and Publicist – olgar@clemsn.edu - 864-656-3051

Jennifer Hogan – Alumni Coordinator & Professional Development – jrhogan@clemsn.edu - 864-656-0746

Cassie Gregory – Cell Culture, Space Allocation – cassieg@clemsn.edu - 864-656-1710

Chad McMahan – Histology, Safety – clmcmah@clemsn.edu - 864-656-5553

Cameron Hay – MUSC Program Coordinator – hayc@muscn.edu - 843-876-2395



GRADUATE STUDENT FINAL LAB CLOSE OUT CHECKLIST

This form shall be completed by the graduate student who is leaving and submitted to department safety officer (Chad McMahan) prior to / when requesting a final closeout inspection.

Student Name: _____

Building: _____ Room: _____ Department: _____

Principal Investigator(s): _____

Email: _____

Preferred Mailing Address: _____

Chemical Safety

	Yes	No	N/A
Chemical hoods have been cleared of all chemicals and equipment from your research.			
Chemical hoods have been cleaned/decontaminated.			
Was perchloric acid used in any hood/exhaust device in this lab.			
All signs (hazard, caution, etc.) removed where appropriate or if your name is on the sign that will remain it has been removed.			
All chemicals and controlled substances that you have used and will not be used anymore in future projects have been removed or disposed according to CU guidelines.			
Gas cylinders that will no longer be needed have been removed.			
Lab surfaces (shelves, cabinets, benchtops, floors, etc.) have been cleared and cleaned/decontaminated.			
Remaining equipment has been properly cleaned/decontaminated and ownership transferred.			
Refrigerators and freezers cleaned/decontaminated.			
Emergency contact and hazard information changed on lab door(s) if your name has been used.			

Biological Safety

	Yes	No	N/A
Biological safety cabinets(s) have been cleaned of your project materials and decontaminated.			
Equipment used with biological materials have been decontaminated.			
Biohazard areas have all been decontaminated.			
Inventory all of your biological samples, including animal and human tissues, and properly dispose of them or transfer them to other users.			
All biological materials (to include select agents) have been disposed of or transferred.			
All biohazard stickers have been removed if not being used in the lab in future projects.			

Radioactive Materials (if being used)

All Radioactive materials have been properly removed as directed by the university Radiation Safety Officer?

Yes _____ No _____ N/A _____

Procedural and Equipment SOPs

I have written all of the procedural and equipment SOPs for my lab to use when I am gone. These are SOPs for procedures that I have developed and for the equipment that I know how to use.

Yes _____ No _____ N/A _____

University Data (Lab Notebooks) and Materials

	Yes	No	N/A
Identify and transfer to your PI or next responsible party all laboratory notebooks, data, and other materials in which the university has a remaining interest.			
Identify and transfer any university owned data on your personal computers and save and return it to your PI.			
Identify any other confidential information in the lab, such as employment files and records of student activities and ensure that any such records are maintained or disposed of properly.			
Return any university owned computers and other electronics.			

Access Control

	Yes	No	N/A
Return all keys to department.			
Make sure that if you have set passwords on lab computers that those passwords are known to the lab.			
Withdraw access to proprietary software and internal websites.			
Withdraw/remove from internal email lists.			
Withdraw access to subscriptions to outside services/organizations paid for by the university.			

Each student must secure the following certifications prior to leaving the Department:

Student: _____ Date: _____

The lab has been inspected and the student's laboratory is clean and in good condition:

Dept Safety Coordinator _____ Date: _____

To my knowledge the student is cleared for departure:

Advisor: _____ Date: _____

BIOENGINEERING DEPARTMENT CHECKOUT FORM

Instructions: Complete this form before graduating, changing research groups, or withdrawing from the Bioengineering Graduate Program.

Date: _____

Student Name: _____

Student CUID: _____

Phone Number: _____

Email Address: _____

Effective Date: _____

- Keys have been returned to department office.
- Final lab close out checklist has been completed with Advisor and Department Safety Coordinator.
- Cleaned Desk and returned all necessary items to appropriate people.

Please share any future plans, job interviews, final acceptance or graduate school:

Final Checkout:

Graduate Student Services Coord.: _____ Date: _____

ACKNOWLEDGEMENT FORM

My signature certifies that I have received the **Graduate Student Handbook for the Department of Bioengineering** at Clemson University. The departmental handbook refers all graduate students to the Graduate School webpage for information regarding Graduate School Policies and Procedures and Academic Regulations. I have read the information and understand its requirements. This form should be turned in to Trish Nigro (pnigro@clemson.edu) within two weeks of classes starting.

The electronic version of this handbook is available on our website:

<https://www.clemson.edu/cecas/departments/bioe/academics/masters/resources.html>

Name: _____

Signature: _____

Date: _____



Clemson University
Department of Bioengineering
301 Rhodes Research Center
Clemson, SC 29634

