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Introduction

This manual has been prepared to acquaint graduate students with the basic policies and operating procedures of the Department of Bioengineering and to call attention to the more important rules and regulations of the University that apply to graduate students. The Graduate School sets the basic policy for all graduate programs and is responsible for final decisions in policy matters. You can access the Graduate School Policy Handbook using this link:

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

This should be followed, where necessary, by discussions 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.

Department Chair
Dr. Martine LaBerge
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
Clemson University, Clemson SC 29634
Phone: 864-656-7276
Email: pnigro@clemson.edu

Graduate Program Coordinator
Dr. Agneta Simionescu
501-1 Rhodes Research Center
Clemson University, Clemson SC 29634
Phone: 864-656-3729
Email: Agneta@clemson.edu

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
Academic Regulations

Students are encouraged to pursue a core plan of study as defined in their 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.

Academic Standing

A graduate student must maintain a minimum overall 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.

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.

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 this art. These communication skills must include verbal presentation, both oral and written, 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 (see below). Further speaking experience will be gained by making 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. The principal writing experience, however, will be the preparation of the Ph.D. dissertation or M.S. thesis.
Clinical Internship

The Bioengineering Department offers a clinical 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 activity 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. In the department, clinical internships provide time so that the course material and laboratory experiences provided in the classroom setting may be assimilated with applications learned from the clinical 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.

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 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.

The 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.

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 and maximum of five 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.
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; if they serve as one of the statutory members of the committee, they must be appointed to adjunct faculty status. 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. Students seeking the master’s in biomedical engineering are advised by the M.Eng.-degree-program coordinator.

**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.

**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 (http://www.grad.clemson.edu/forms/pdf/GS2-14.pdf) to document the fulfillment of requirements for an “en route” master’s degree and the faculty’s recommendation to award the “en route” masters 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.

**Review of Progress / Student Evaluation System**

1. All M.S and Ph.D. students must submit Part I 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. 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. 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

No grade for BIOE 8910, 8920, 9910 will be assigned if forms are not returned before the deadline for grade submission.
Master of Engineering in Biomedical Engineering  
(M. Eng. in Biomedical Engineering)

Program Objectives
The M.Eng. in Biomedical Engineering (BME) 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. 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 core biomedical engineering plus 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 science; they will gain an in-depth knowledge of an essential area in biomedical engineering. Graduates will be equipped to design biomedical 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. All M.Eng. graduates will demonstrate:

1. An ability to apply mathematics, life sciences, physical sciences, 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 for proficient contemporary technical and scientific comprehension and lifelong learning.
5. An ability for proficient technical and scientific communication. (SLO5)
6. An ability to use advanced techniques, skills, and modern engineering tools necessary for biomedical engineering practice.
**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’s 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 and technical elective 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 8130 - Industrial Bioengineering (3 credits) (3,0)
- 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)

**Recommended Elective:**

- BIOE 8900 - Internship (1-6 credits)

*The additional credits of graduate technical elective courses must be selected from the list of course offerings. Please contact the M.Eng. Degree Program Coordinator for assistance.*
Master of Science in Bioengineering

The curriculum for the M.S. degree in bioengineering is designed around two basic options: a thesis option requiring formal research and a non-thesis option that concentrates on coursework, but requires a final report. The final defense for the non-thesis option will cover the student's entire body of coursework, reflecting the emphasis on courses. The report will typically take the form of an in-depth literature survey or a detailed analysis of a sub-topic within the field of bioengineering.

General requirements for both options are:

1. The student must spend at least one academic semester in residence.
2. The usual minimum time period necessary to complete all requirements is 18 months.
3. The student must successfully present and defend a thesis or report in an oral comprehensive examination, which will be open to the public.

Requirements specific to the thesis option are:

1. The student must successfully complete a minimum of 30 credit hours, including six credit hours of research, which will provide the basis for a thesis.
2. The student must submit an approved thesis to the Graduate Dean at least one week before the end of the semester in which the degree is expected.

Requirements specific to the non-thesis option are:

1. The student must successfully complete a minimum of 33 credit hours, which include six credit hours of non-thesis research, special topics, or internship at an approved external institution.
2. The student is required to prepare a final report whose subject will be chosen by the advisor in cooperation with the student. The final report must be comparable in form and quality with technical review articles appearing in peer-reviewed journals and requires approval by the advisory committee.
3. The student is not required to submit the final report to the Graduate School.
MS Degree Core and Tracks

M.S. Thesis Degree – 30 credits (including 6 research credits (BIOE 8910))

DEPARTMENTAL CORE

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

TRACKS – RESEARCH FOCUSED

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<thead>
<tr>
<th>Biomaterials Engineering</th>
<th>Regenerative Medicine</th>
<th>Bioelectrical Engineering</th>
<th>Biomechanical Engineering</th>
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<tr>
<td>TRACK CORE CLASS: BIOE 8010 - Biomaterials</td>
<td>TRACK CORE CLASS: BIOE 8010 - Biomaterials</td>
<td>TRACK CORE CLASS: BIOE 8700 - Bioinstrumentation</td>
<td>TRACK CORE CLASS: BIOE 8200 - Biomechanics</td>
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<td>Track Members: Bob Latour (Track Chair) Jeoung Soo Lee Ying Mei Alexey Vertegel Jeremy Gilbert Angela Alexander-Bryant</td>
<td>Track Members: Dan Simionescu (Track Chair) Aggie Simionescu Ann Foley Sarah Harcum Jeremy Mercuri Naren Vyavahare Ken Webb Brian Booth Renee Cottle</td>
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<td>Track Members: Jiro Nagatomi (Track co-Chair) Martine LaBerge (Track co-Chair) Hai Yao Melinda Harman John DesJardins Will Richardson</td>
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Degree Program for Doctor of Philosophy

General Information

Graduate work leading to the Doctor of Philosophy degree is intended to provide the student with knowledge of his or her field of specialization and a mastery of both associated fields and methods of 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: grasp of the subject matter of a broad field of study, competence in planning and conducting original research and the ability to communicate adequately and professionally in both the oral and written forms of the English language.

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. To this end, the student must pass the departmental doctoral program qualifying examination and the doctoral research proposal defense prior to officially being admitted into the doctoral program. An M.S. degree is not necessary to enroll in the doctoral program.

Specific Regulations

Doctoral work, dealing with intensive study and research as it does, requires dedication and devotion to the subject of inquiry. The desired level of concentration and concern cannot be achieved where the student holds, throughout the period of his 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 campus.

Qualifying Exam and Proposal Defense

Please refer to Appendix for Rules and Regulations of the Ph.D. Qualifying Exam.

The qualifier exam will be followed by the defense of the research proposal on the doctoral research topic to be conducted and administered by the research advising committee under the supervision of the major research advisor (see Appendix). After successfully passing the proposal defense, the student is formally admitted as a candidate for the Ph.D. degree. Satisfactory completion of the qualifier exam and proposal defense must occur no less than six months and no more than five years prior to the date of graduation. 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).
Ph.D. Curriculum

A total of 60 credit hours composed of the following:

- **10 core course credit hours**
  - BIOE 8160 (3)
  - BIOE 8460 (3)
  - STAT 8010 (4)
- **6 credit hours of graduate BIOE Seminar**
  - BIOE 8000 (1 per semester)
- **26 graduate elective credits**
- **18 credit hours of doctoral research**
  - BIOE 9910

Consult with research advisor and Ph.D. dissertation committee members regarding elective credits. Please refer to Ph.D. Degree Core and Tracks.

**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

**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.

**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.

**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.
Ph.D. Degree Core and Tracks

PHD Degree – 60 credits (including 18 research credits (BIOE 9910))

DEPARTMENTAL CORE

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<tr>
<th>Course</th>
<th>Credits</th>
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<tr>
<td>STAT 8010 – Statistical Methods I</td>
<td>3 credits</td>
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<td>BIOE 8000 – Seminar</td>
<td>up to 6 credits</td>
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<td>BIOE 8460 – Biomedical Basis for Engineered Replacements</td>
<td>3 credits</td>
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<tr>
<td>BIOE 8160 – Bioengineering Career Professional Development</td>
<td>3 credits</td>
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TRACKS – RESEARCH FOCUSED

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<td>BIOE 8010 - Biomaterials</td>
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<td>Track Members:</td>
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<td>BIOE 8490 – Tissue Eng</td>
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<td>BIOE 8730 – Regen Med</td>
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</tr>
<tr>
<td>John DesJardins</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Will Richardson</td>
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</tr>
</tbody>
</table>
Financial Aid

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.

Graduate Teaching Assistants (GTA) and Graduate Laboratory Assistants (GLA)

The Department of Bioengineering provides funding to select graduate students in the form of graduate teaching assistantship and graduate laboratory assistantship. Both graduate teaching assistants (GTAs) and graduate laboratory assistants (GLAs) serve each semester as a co-instructor, a teaching assistant, a laboratory assistant or a grader for bioengineering courses. GTA and GLA funding is provided only to students enrolled in the doctoral program. A letter of offer is sent to the student and signed by the chair of the department. The assistantship is renewed annually based on performance in the classroom or laboratory as an instructor, a teaching assistant, a laboratory assistant or a grader and upon the student’s demonstration of satisfactory progress toward the doctoral degree (as documented in Form 2 and Form 3 of the BIOE Student Evaluation System), typically for a maximum of four years. Full time enrollment is required of these students. Supervision for these assignments is assumed by the instructor of record of a course, a lab manager, or the faculty member in charge of a departmental facility. An assignment may include routine laboratory maintenance and clean-up and other activities associated with the assigned laboratory/lab course. The assignment will not necessarily be directly related to the student’s own research.

In the event that a GTA or GLA changes degree from Ph.D. to M.S. (thesis or non-thesis) or M.Eng., the graduate assistantship provided by the department will be terminated at the end of the semester before the Change of Degree becomes in effect.

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.

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. You may access information in this link (http://www.clemson.edu/employment/benefits/aca/aca_updates.html).
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 Department Chair, who will then refer the problem to the appropriate University office.

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 (http://www.grad.clemson.edu/HealthInsurance.php).
General Departmental Regulations

Ordering of Equipment and Supplies, P-Card and buyWays

Tracking-order 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). ALL purchases on the PCARD and Buyways MUST be approved by the advisor or Principal Investigator before processing. Any deviations from policies or inappropriate use of the PCARD will result in loss of privileges.

Any purchase over $2,500 requires a purchase order. See Michelle Kirby in 301 Rhodes for instructions on how to order items over $2,500.

See the Academics tab on the departmental website for forms.

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

Building Access, Keys and Security

Graduate students will have access to the building after hours by scanning their Tiger ID card 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 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.
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.

Emergencies with injury during research projects, while attending meetings, conferences, etc. outside the university setting are dealt with as follows: Catastrophic injury (life threatening) — Call 911 and call COMPENDIUM at 877-709-2667. Noncatastrophic injury (requires medical treatment, but is not life threatening) — Call COMPENDIUM at 877-709-2667. It is recommended that the call to COMPENDIUM be made by the employee’s supervisor or advisor. COMPENDIUM MUST be called before going to a physician or emergency room.

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 Maria Torres 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

For more information regarding safety, please visit our website: http://www.clemson.edu/cecas/departments/bioe/academics/forms/index.html

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.

Email

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.
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.

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: http://www.clemson.edu/campus-life/campus-services/parking/index.html
Miscellaneous

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.

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.

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.

Acknowledgement Form

All new students in the Bioengineering Department must return the acknowledgement form (see Appendix) to Maria Torres, Graduate Student Services Coordinator, within the first week of enrollment in the program. No paycheck will be issued until the receipt of acknowledgement is returned.
Appendix
<table>
<thead>
<tr>
<th>Timeline</th>
<th>Action item</th>
<th>Submit to</th>
<th>Student</th>
<th>Advisor</th>
<th>Advisory committee</th>
<th>Track committee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enroll</td>
<td>Meet with advisor and declare track (Track form)</td>
<td>BIOE Grad Student Coordinator</td>
<td>☒</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>1st semester</td>
<td>Evaluation (Form 1)</td>
<td>BIOE Grad Student Coordinator</td>
<td>☒</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>1st semester</td>
<td>Committee Selection</td>
<td>IROAR</td>
<td>☒</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2nd semester</td>
<td>Plan of Study (Form GS2)</td>
<td>IROAR</td>
<td>☒</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3rd semester (early)</td>
<td>Advisory Comm. Mtg. – advise student about <strong>topics that must be covered</strong> for qualifier (add to Track Form)</td>
<td>Track Committee</td>
<td>☒</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3rd semester (end)</td>
<td>Selection of 8 qualifier questions from database</td>
<td></td>
<td>☐</td>
<td>☒</td>
<td>☐</td>
<td>☒</td>
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<tr>
<td>3rd semester (end)</td>
<td>Selection of 3 project-specific questions</td>
<td></td>
<td>☐</td>
<td>☒</td>
<td>☐</td>
<td>☒</td>
</tr>
<tr>
<td>4th semester first 2 weeks</td>
<td>Qualifier Exam 5/8 + 2/3 questions</td>
<td>Track Committee</td>
<td>☒</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>4th semester</td>
<td>Grade Questions (2 weeks)</td>
<td></td>
<td>☐</td>
<td>☒</td>
<td>☐</td>
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<tr>
<td>4th semester</td>
<td>Oral qualifier exam (if needed)</td>
<td></td>
<td>☒</td>
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<tr>
<td>6th semester</td>
<td>Proposal Defense</td>
<td></td>
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<tr>
<td>6th semester</td>
<td>Submit Comprehensive Exam form (Form GS5) &amp; Assessment forms</td>
<td>BIOE Grad Student Coordinator</td>
<td>☒</td>
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<tr>
<td>Last semester</td>
<td>Dissertation Defense Notice (10 days prior to defense)</td>
<td>BIOE Grad Student Coordinator</td>
<td>☒</td>
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<td>☐</td>
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</tr>
<tr>
<td>Last semester</td>
<td>Final Dissertation Defense</td>
<td>Advisory Committee</td>
<td>☒</td>
<td>☒</td>
<td>☐</td>
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<tr>
<td>Timeline</td>
<td>Action item</td>
<td>Submit to</td>
<td>Student</td>
<td>Advisor</td>
<td>Advisory committee</td>
<td>Track committee</td>
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<tr>
<td>Last semester</td>
<td>Final Dissertation Defense Results</td>
<td>BIOE Grad Student Coordinator</td>
<td>☒</td>
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<td></td>
<td>(Form GS7)</td>
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<tr>
<td>Last semester (beginning)</td>
<td>Graduation Application</td>
<td>IROAR</td>
<td>☒</td>
<td>☐</td>
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<td>☐</td>
</tr>
<tr>
<td>Last semester</td>
<td>Upload Dissertation - Formatting Review</td>
<td>Graduate School - Manuscript Office</td>
<td>☒</td>
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<td>☐</td>
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<tr>
<td>Last semester</td>
<td>Upload final approved manuscript</td>
<td>Graduate School - Manuscript Office</td>
<td>☒</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>End of each semester</td>
<td>Evaluation Forms (Form 2 – Student)</td>
<td>BIOE Graduate Student Services Coordinator</td>
<td>☒</td>
<td>☒</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>End of each semester</td>
<td>Evaluation Forms (Form 3 – Advisor)</td>
<td>BIOE Graduate Student Services Coordinator</td>
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</tbody>
</table>

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

- All documents such as proposal and final manuscript are due to the committee at least 10 days prior to the scheduled defense

Graduate School Deadlines: [http://www.clemson.edu/graduate/students/deadlines.html](http://www.clemson.edu/graduate/students/deadlines.html)
TRACK FORM

Student name:

Committee meeting date:

Enrollment date:

Track(s) selected:

Committee members:

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

Advisor name and signature ________________________________

Date of committee meeting ________________________________
Bioengineering Ph.D. Qualifier Exam – Rules and Regulations

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

☐ Biomaterials
☐ Bioinstrumentation
☐ Biomechanics
☐ Regenerative Medicine

QUALIFIER EXAM DATE (QUALIFIER MUST BE TAKEN NO LATER THAN ONE AND A HALF YEARS AFTER PHD 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

☐ A Ph.D. student is required to 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.

☐ Written exam consists of 7 questions: 5 questions (from a list of 8) from selected research track(s), and 2 questions (from a list of 3 developed by the advisor) related to the student’s research project. Questions will evaluate the student’s ability to think critically and apply knowledge gained from the core track courses.

☐ Exam is administered and graded by appropriate faculty members.

☐ Grades are returned to the advisor, who will communicate them to the student.

☐ A passing grade is 75% or higher; if lower, a list of deficiencies is forwarded to the student. The 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 at the next available opportunity.

☐ 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: the student’s advisor (or committee member appointed by advisor) and other appropriate 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.)

☐ The exam is administered no later than one month after the list of deficiencies is received by the student.

☐ 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.
Student’s Name: ________________________________

1. Ph.D. Research Track: ____________________________________________

2. CV included? Yes ____ No ____  Department CV format? Yes _____ No _____

3. Signed GS2 form included? Yes______No______
   Does the committee include someone from outside the department? ____________
   If so, from which department/institution is the committee member: ____________

________________________________________________________________________

Average exam grade: _______________________/100

Results of written exam: Pass Fail

If the result is Fail, please indicate if an oral exam is recommended: Yes No
   Date of oral exam: ____________

   Result of oral exam: Pass Fail

Additional comments from committee or advisor (optional):
Department of Bioengineering
Guidelines for Proposal Defense

Requirements

• The doctoral proposal defense must be taken within 2 full academic semesters (fall-spring, spring-fall) following passing of 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 - Please search [www.nsf.gov](http://www.nsf.gov) for latest version NSF PAPPG

NIH format - Please search [www.grants.nih.gov](http://www.grants.nih.gov) for latest version

• 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 seminar may be determined by the student and advisor, the presentation **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](https://www.clemson.edu/graduate/files/pdfs/GS5D.pdf))

Student Name: _______________________

**Proposal Exam Assessment**

**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:

<table>
<thead>
<tr>
<th>Pragmatic Envisioning Skills</th>
<th>Excellent (5)</th>
<th>Very Good (4)</th>
<th>Good (3)</th>
<th>Fair (2)</th>
<th>Poor (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has a well-founded hypothesis or overall project goal.</td>
<td>Has a well-founded hypothesis/goal. Could be stated earlier or more clearly in the document.</td>
<td>Has a hypothesis / goal. Motivation not very clear and/or statement is not clear.</td>
<td>Some attempt at hypothesis/goal statement. Not clearly stated and/or lacks the motivation.</td>
<td>No defined hypothesis or goal is stated in the proposal</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

| Critical evaluation of literature (advanced knowledge) | Demonstrates critical evaluation of the current state of the literature. Multiple research groups properly cited. Clear description of the works that motivate the reasoning for the proposed work. | Demonstrates critical evaluation of the current state of the literature. Multiple research groups properly cited, most works are clearly described and demonstrate what 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; alternate approaches to ensure success are described. 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 experiments. Few initial results are presented. Methods are missing details. | Missing timeline, initial results and/or descriptions of future experiments. Descriptions of Methods are hard to follow. |

Comments:

| Writing skills | Has distinct proposal structure with clearly defined sections. Coherent sentences. Clear aims/goals. Proposal is well motivated and has the potential to be 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 grammatical errors are present. Some Structure is present, but it could be clearer. | Very hard to read or follow. Sections are not clearly defined. |

Advisor initials:_________ Committee initials:_________
### NIH Proposal Format Assessment:

<table>
<thead>
<tr>
<th>Impact</th>
<th>Score</th>
<th>Descriptor</th>
<th>Additional Guidance on Strength/Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>1</td>
<td>Exceptional</td>
<td>Exceptionally strong with essentially no weaknesses</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Outstanding</td>
<td>Extremely strong with negligible weaknesses</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Excellent</td>
<td>Very strong with only some minor weaknesses</td>
</tr>
<tr>
<td>Medium</td>
<td>4</td>
<td>Very Good</td>
<td>Strong but with numerous minor weaknesses</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Good</td>
<td>Strong but with at least one moderate weakness</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Satisfactory</td>
<td>Some strengths but also some moderate weaknesses</td>
</tr>
<tr>
<td>Low</td>
<td>7</td>
<td>Fair</td>
<td>Some strengths but with at least one major weakness</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Marginal</td>
<td>A few strengths and a few major weaknesses</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Poor</td>
<td>Very few strengths and numerous major weaknesses</td>
</tr>
</tbody>
</table>

**Minor Weakness:** An easily addressable weakness that does not substantially lessen impact  
**Moderate Weakness:** A weakness that lessens impact  
**Major Weakness:** A weakness that severely limits impact

1. 1 page Project summary included? Yes____ No_____  
2. Project description within page limit (12 pg)? Yes____ No_____  
3. Includes appropriate biohazards and animal/human subject sections? Yes____ No_____  
4. Reference section less than 100 references long? Yes____ No_____

**Overall Impact Score:** __________

**Significance Score:** __________

Strengths:

Weaknesses:

**Investigator Score:** __________

Strengths:

Weaknesses:

**Innovation Score:** __________

Strengths:

Weaknesses:

**Approach Score:** __________

Strengths:

Weaknesses:

**Environment Score:** __________

Strengths:

Weaknesses:

Advisor initials: __________ Committee initials: ________________
Student Name: ___________________________

NSF Format Proposal Assessment:

**Ranking:** Excellent, Very Good, Good, Fair, Poor

**Intellectual Merit:** The Lead Reviewer may wish to start with a 2-5 sentence description of the proposal objectives and methods. Other reviewers may skip this. Is there a coherent research plan? What are the technical strengths and weaknesses of the approach? Is it novel or potentially transformative? What are the chances the research will succeed? Are the PIs qualified to do the work? Are the resources adequate?

**Broader impacts:** Will the work be reflected in education programs? Will it help build human infrastructure, labs and partnerships for the research enterprise? Will it be disseminated effectively? How will the research impact the economy, the environment, social well being and the general evolution of science if it succeeds? Is there an effective integration of research and education? (This is a special consideration only in Career Proposals)

**Summary Statement:** 1-4 sentences summarizing your overall view of the proposal’s strengths & weaknesses.

4. 1 page Project summary included? Yes____ No____
   Intellectual Merit and Broader Impact clearly described in summary? Yes_No____

5. Project description within page limit (15 pg)? Yes_____No_______

6. Reference section less than 100 references long? Yes____ No_______

Overall Ranking: _________________

Intellectual Merit Rank: _________________

Broader Impact Rank: _________________

Advisor initials: ___________Committee initials: ____________________________________
# Part 2: Proposal Exam Presentation Assessment

<table>
<thead>
<tr>
<th>Pragmatic Envisioning Skills</th>
<th>Excellent (5)</th>
<th>Very Good (4)</th>
<th>Good (3)</th>
<th>Fair (2)</th>
<th>Poor (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has a well-founded and clearly stated hypothesis or overall project goal.</td>
<td>Has a well-founded hypothesis/goal. Could be stated earlier or more clearly in the document.</td>
<td>Has a hypothesis/goal. Motivation not very clear and/or statement is not clear.</td>
<td>Some attempt at hypothesis/goal statement. Not clearly stated and/or lacks the motivation.</td>
<td>No defined hypothesis or goal is stated in the Proposal.</td>
<td></td>
</tr>
</tbody>
</table>

**Comments:**

<table>
<thead>
<tr>
<th>Critical evaluation of literature (advanced knowledge)</th>
<th>Demonstrates critical evaluation the current state of literature. Multiple research groups properly cited; clear description of the works that motivate the reasoning for the proposed work.</th>
<th>Demonstrates critical evaluation the current state of literature. Multiple research groups properly cited. Most works are clearly described; works motivate the reasoning for the proposed work.</th>
<th>Describes prior work. Properly cites multiple research groups. However, connection to current work is not always clear.</th>
<th>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.</th>
<th>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.</th>
</tr>
</thead>
</table>

**Comments:**

<table>
<thead>
<tr>
<th>Applied research principles</th>
<th>Preliminary results well described and interpreted; show capability and proof-of-concept and support goal. Methods for future experiments clearly described; alternative approaches to ensure success described. Includes a timeline for overall project.</th>
<th>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.</th>
<th>Includes some description of preliminary results, timeline, and future experiments. Methods could be clearer.</th>
<th>Includes a timeline and descriptions of future experiments. Few initial results presented. Details are missing from Methods.</th>
<th>Timeline, initial results and/or descriptions of future experiments are missing. Descriptions of methods are hard to follow.</th>
</tr>
</thead>
</table>

**Comments:**

<table>
<thead>
<tr>
<th>Oral presentation skills</th>
<th>Is clear and precise in oral presentations. Is comfortable answering audience questions</th>
<th>Is clear and precise in oral presentations</th>
<th>Presents in understandable manner.</th>
<th>Lacks confidence/somewhat hard to follow</th>
<th>Presentation very hard to follow or understand</th>
</tr>
</thead>
</table>

**Comments:**

Advisor initials: Committee initials: ___________________________
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: https://www.clemson.edu/graduate/students/policies-procedures/index.html

I have read the information and understand its requirements.

The electronic version of this handbook is available on our website: http://www.clemson.edu/cecas/departments/bioe/academics/phd/resources.html

Name: ________________________________

Signature: ________________________________

Date: ________________________________