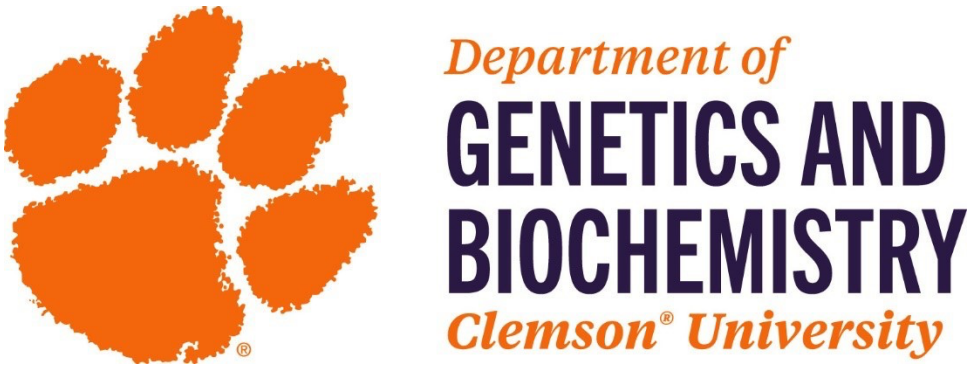
Handbook of Ph.D. Degree Programs in Genetics and Biochemistry and Molecular Biology



Department of Genetics and Biochemistry

College of Science

Clemson University

Revised: 05/2025

FOREWORD

This booklet has been prepared by the Genetics & Biochemistry faculty to inform Ph.D. graduate students of Departmental and Graduate School policies and regulations. The Graduate School Policies (available on the web at https://www.clemson.edu/graduate/students/policies-procedures/index.html) are the underlying regulations, so students should also become fully acquainted with the information contained on that webpage. Not being familiar with regulations may cost a student, their advisor, and the department time and money. Advice about other aspects of graduate study is included in the last section of this manual.

In Section XI, there is a checklist of important events and deadlines in the progression toward your degree. We suggest that students examine this list and carefully plan their activities as soon as possible. Some changes may be in order as time goes by, but this outline will serve as a good reminder and can be used by the Advisory Committee in a yearly evaluation of each student's progress. Careful planning assists with coordinating funding sources and teaching assistantship activities; thus, you are strongly advised to continue planning and requesting input throughout your program.

We expect that this guidebook will be updated regularly. Policies that affect a given student are the ones in place at the time the student began the degree program. As a rule, policy changes apply only to incoming students, but students already in the program can opt to follow the new policies if they wish.

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SECTION I. ASSISTANTSHIP SUPPORT

A. Support

Ph.D. graduate students can be supported either on a teaching assistantship or a research assistantship. Teaching assistants (TAs) are assigned by the Department, as recommended by the Graduate Committee, for students with good oral English communication skills to assist professors and lecturers in teaching the laboratory and lecture courses offered by the Department. TAs may also be assigned (full time or half-time) to assist faculty who teach large courses (100+ students) in grading and other teaching responsibilities. Students with teaching assistantships will also assist in proctoring exams for large courses, or if a faculty member cannot attend one of her/his own exams.

Teaching assistantships are limited in number and are offered to outstanding applicants based on their transcripts, experience, and recommendations. Teaching assistantships provide opportunities to learn skills valuable to career scientists but require a strong commitment to learning; thus, TAs are expected to take their roles seriously.

There are a limited number of research assistantships also available to entering Ph.D. graduate students at the discretion of individual investigators. These may be offered before enrollment based on their transcripts, experience, and recommendations, as well as their interests in research programs under the direction of a particular investigator. Arrangements for research assistantships are usually worked out between the applicant and the professor. The formal admission decision is made by the Graduate School and the applicant receives notification of the decision via written correspondence from the Dean of the Graduate School. Once offered, continuing financial support, as required by the Department, is the responsibility of the Major Advisor (see Section II. Selection of Major Advisor) through research assistantships (from funds related to the Major Advisor's research projects) or through teaching assistantships in consultation with the Department Chair. Some policies, especially the structure of the first-year graduate experience, will differ depending on the student's status as a TA or research assistant (RA).

Ph.D. assistantships within our department include a tuition waiver; however, you will be responsible for payment of the applicable graduate student fees each semester (fall, spring, and summer if enrolled).

B. Employment

Because a graduate degree is a full-time commitment, the department discourages enrollment of students into the Genetics or Biochemistry & Molecular Biology Ph.D. programs who do not have full stipend support. Assistantships are nominally awarded for up to 20 hours of this work each week, with the balance of time to be spent on coursework and dissertation research. Ph.D. students within the program may not be employed more than 10 hours per week while supported on a stipend and no more than 20

hours a week at any time. Students on research assistantships must adhere to the outside employment policy of the funding agency. Part-time degree students are not allowed. By University policy, full-time status is defined as being enrolled in 9 credit hours each in fall and spring. Students on 12-month research assistantships must enroll for 6 credit hours each summer.

C. Termination of Assistantship

A teaching or research assistantship may be terminated at any time for substandard, unsatisfactory, or unethical performance. A TA or RA who acts in an inappropriate manner will be given notice of deficiencies/unacceptable behavior in writing via a certified letter to the student's residence, hand-delivered letter, or e-mail to the student by their Major Advisor, the Graduate Committee, or the Department Chair. A copy of this written notice will be kept in the student's file.

If redemptive action is not taken immediately by the student, a letter of dismissal from the Department Chair and the Graduate Dean will be sent via certified mail to the student's residence, hand delivered, or e-mailed to the student. Depending on the severity of the deficiency/unacceptable behavior, the Department Chair's letter of dismissal may be sent in as little as 2 weeks following the first notice.

SECTION II. SELECTION OF THE MAJOR ADVISOR

A. Teaching Assistants (TAs)

Students who are accepted as TAs will spend their first academic semester doing research rotations in the laboratories of three faculty members to assist them in identifying a Major Advisor by the end of that semester. Research rotations are meant to introduce students to the type of research and atmosphere of the individual labs. Students may rotate in the laboratories of faculty who have a 51% or greater appointment in the Department. Students will begin the first rotation on the first Monday after classes start. Each rotation is five weeks long. With the approval of the Department chair, TAs can move to a research assistantship at the beginning of any semester after the first semester if their chosen Major Advisor can support them.

First semester rotation students will sign up for the appropriate number of hours of GEN/BCHM 9910 research under the Department Chair and be given a P/F grade for their work in the labs. By the end of the third rotation, all rotation students are required to choose a lab, by mutual agreement of the faculty member and the student, and approval of the Department Chair.

Each student **MUST** perform three rotations, even if they have decided upon a Major Advisor early in the rotation cycle. Until a student selects a lab, the Department Chair is the Major Advisor. Under very rare circumstances, students may perform a fourth rotation in order to identify a Major Advisor. Permission to perform a fourth rotation is granted by the Departmental Chair.

B. Research Assistants (RAs)

Because RAs have chosen a faculty advisor by mutual agreement before matriculation, that faculty member, as the Major Advisor, will counsel the new graduate student in making initial decisions concerning coursework and plan of study (GS2) as outlined by the Graduate School requirements. The Major Advisor and student will discuss mutual research interests and possible research projects. Continuing support is based on performance of the student in the research laboratory. It is the responsibility of the Major Advisor to make the student aware of ongoing research in the lab and to help the student understand the work philosophy of the Major Advisor's research laboratory.

C. Major Advisors outside the Department

A Ph.D. student may be supported as an RA in the laboratory with a co-Major Advisor who has a minority appointment (less than 50% appointment) in the Department, but the student must also identify a co-Major Advisor who is a full-time (greater than 51% appointment) tenured or tenure-track faculty member in the Department of Genetics and Biochemistry. The co-Major Advisors and the graduate student must follow the guidelines in Section III for composition of the Advisory Committee. However, in this case, financial support for this student must come from the external co-Major Advisor and/or the Department in which the external co-Major Advisor holds their majority appointment.

SECTION III. THE ADVISORY COMMITTEE

A. Composition

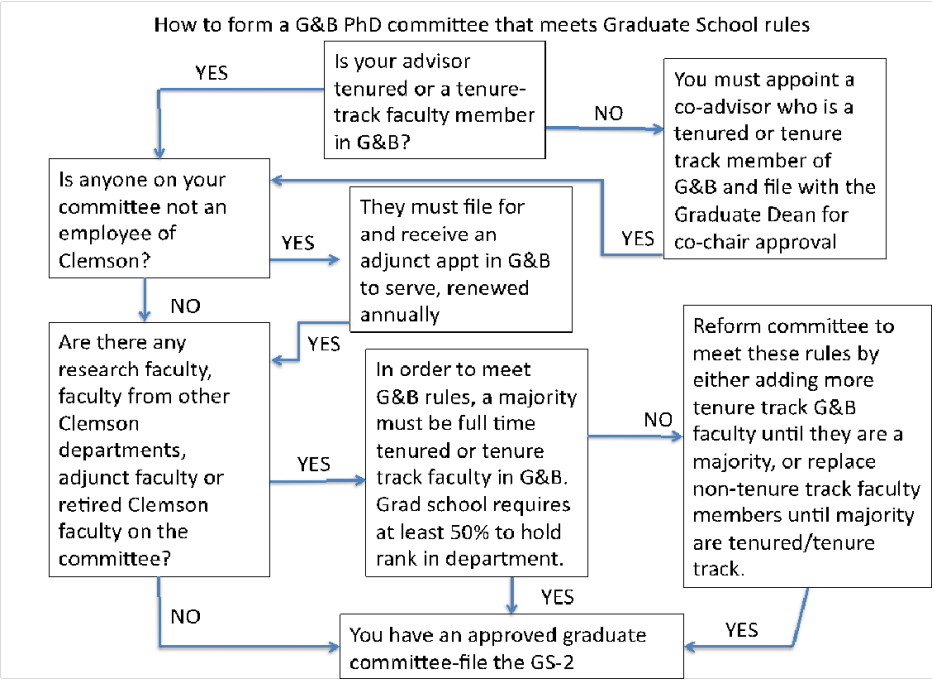
Prior to the beginning of the second year, the Major Advisor and the student must organize an Advisory Committee of faculty members that oversees the progress of the graduate student toward the Ph.D. degree. For students who transit from one of our Master's programs, the Advisory Committee shall be formed no later than the end of the second semester after the transit. This committee also administers written and oral examinations for admission to candidacy for the Ph.D. degree. The Chair of the Advisory Committee may be the Major Advisor and must be a tenured or tenure-track faculty member of the Department of Genetics and Biochemistry (51% or more appointment). The Major Advisor will supervise the research and, together with the Advisory Committee, ensure that the quality of the research meets the standards of the Department.

The Advisory Committee will have a minimum of four members (including the Major Advisor) for Ph.D. students. The majority of members must be full-time (more than 51% appointment) tenured or tenure-track faculty in the Department of Genetics and Biochemistry. An additional member of the committee may be a faculty person from outside the university whose research is in an area compatible with the proposed research. This member will participate at minimum as a reader of the dissertation, with greater participation at the option of the student, the committee and the outside member. Students and

Major Advisors should be aware that while addition of an outside faculty member is strongly encouraged, there are complications such as adjunct appointment status (which requires submission of transcripts and department and university approval) and availability for committee meetings that must be addressed.

When the Advisory Committee is formed, the student needs to file the Committee Selection section of the GS2 form (https://www.clemson.edu/graduate/students/gs2-hints.html) through iROAR. It is possible in extenuating circumstances to change the composition of a student's Advisory Committee before completion of the degree. In such circumstances, a new GS2 form must be electronically filed with the Graduate School and approved by the members of the new Advisory Committee, the Graduate Coordinator and the Department Chair. This must occur at least 6 months prior to the defense.

Below is a helpful flowchart for assembling an Advisory Committee that meets the needs of the student, the department, and the Graduate School.



B. Responsibilities

The Advisory Committee, convened by the Chair, reviews the student's plan of study, decides on appropriate coursework, conducts the Comprehensive Exam (See Section VIII. Specific Requirements), assists in the preparation of and approves the dissertation, and makes the final recommendation to award the degree. This committee is designed to help the student complete a strong dissertation and ensure the quality of the training of the student; thus, the composition of the committee should facilitate this process.

C. Advisory Committee Meetings - Presentation of Research

The student will meet with the Advisory Committee at least once per calendar year and it is the student's responsibility to schedule these meetings. The student is expected to give a short presentation at

the first meeting with the Advisory Committee that outlines the research project and progress to date. Similar presentations are expected at each subsequent meeting of the Advisory Committee. The intent is to verify that the student is making reasonable progress in accomplishing the research objectives and make recommendations.

SECTION IV. THE GRADUATE COMMITTEE

The Graduate Committee is charged in the Departmental Bylaws to "coordinate the recruiting, selection, and admission of graduate students and make recommendations for financial support, as well as review student performance." In order to discharge this responsibility, the Graduate Committee surveys each graduate student in the Department annually to review the student's progress and performance. Completion and submission of a survey form (see Section XIII. Additional Information, Part E) to the Graduate Committee before July 1 of each year is required. The completed form will be added to the student's file as part of the yearly progress record. The committee will consider as part of the review process the grades in formal coursework. For students supported on a teaching assistantship, teaching evaluations and evaluation comments from the laboratory prep staff and faculty responsible for the course will also be considered. The Graduate Committee will forward the file to the Department Chair, along with a report from the Committee regarding any student the Committee feels requires further review. Thus, the Graduate Committee review serves as a screening mechanism for the Department Chair.

SECTION V. GRADUATE CURRICULUM

A. From the Graduate School:

"Coursework leading to the Doctor of Philosophy degree is planned to give a comprehensive knowledge of a student's field of specialization and a mastery of the methods of research. The degree is not awarded solely based on coursework completed, residence, completion of preliminary of comprehensive examinations, or other routine requirements. The final basis for granting the degree is the student's grasp of the subject matter across a broad field of study, competence in planning and conducting research, and the ability to express oneself adequately and professionally, both orally and in writing."

"Consistent with SACSCOC guidelines, the Graduate School requires that a doctoral degree typically comprise a minimum of 30 credits beyond the master's degree, and typically at least 60 credits beyond the bachelor's degree. The advisory committee aids in developing an individualized curriculum (to be outlined in the GS2 Plan of Study) which meets program requirements and provides appropriate training to meet your goals.

In conjunction with meeting the minimum total credit hour requirements for a doctoral degree, a minimum of 12 credit hours of non-research coursework and a minimum of 18 hours of dissertation research are required for any doctoral degrees."

B. Graduate Degree Plan of Study (GS2 Form)

Upon selection of a Major Advisor, the student should confer with the Major Advisor and prepare a Plan of Study and select members of the Advisory Committee. The Advisory Committee should meet by the beginning of the second year for Ph.D. students and approve the GS2 Plan of Study Form. The GS2 Form must be filed electronically through iROAR.

C. Coursework

Curriculum for Ph.D. in Genetics

First Year:

Fall Semester:

Issues in Research GEN 8050 (3,0)

Advanced Molecular Biology GEN 8110 (4,0)

Seminar GEN 8250 (1,0)

Research GEN 9910 (1,0)

Spring Semester:

Advanced Genetics GEN 8140 (4,0)

Seminar GEN 8250 (1,0)

Research GEN 9910 (4,0)

Summer (for 12-month assistantship appointments only):

GEN 9910 (6,0)

Second Year:

Fall Semester:

Seminar GEN 8250 (1,0)

Statistical Methods I STAT 8010 (3,0) (suggested to fulfill statistics requirement)

Research GEN 9910 (X,0) – up to 9 credits total

Spring Semester:

Seminar GEN 8250 (1,0)

Elective course*

Research GEN 9910 (X,0) – up to 9 credits total

Summer (for 12-month assistantship appointments only):

GEN 9910 (6,0)

Future years:

Subsequent Fall/Spring semesters:

Seminar GEN 8250 (or GEN 8510 in last semester) each semester (1,0)

Research GEN 9910 (X,0) – up to 9 credits total

Summer semesters (for 12-month assistantship appointments only):

Research GEN 9910 (6,0)

* The Ph.D. degree in Genetics requires a minimum of 15 hours of coursework. You are required to fulfill a Statistics Requirement for which we suggest STAT 8010. You must complete one additional credit of non-research coursework. Elective course selection needs to be approved by your Advisory Committee. Additional hours required for full time status are fulfilled by GEN 9910 for Ph.D. students. At least 18 hours of GEN 9910 are required for the Ph.D. In addition, all students must register for Seminar GEN 8250 (1,0) each semester enrolled. Full-time status is 9 hours for fall/spring semesters and 6 hours for summer semester. Enrollment during summer semester is required only for 12-month assistantship appointments or for students planning to graduate in summer semester.

Curriculum for Ph.D. in Biochemistry & Molecular Biology

First Year:

Fall Semester:

Issues in Research BCHM 8050 (3,0)

Advanced Molecular Biology BCHM 8110 (4,0)

Seminar BCHM 8250 (1,0)

Research BCHM 9910 (1,0)

Spring Semester:

Advanced Biochemistry BCHM 8140 (4,0)

Seminar BCHM 8250 (1,0)

Research BCHM 9910 (4,0)

Summer (for 12-month assistantship appointments only):

BCHM 9910 (6,0)

Second Year:

Fall Semester:

Seminar BCHM 8250 (1,0)

Statistical Methods I STAT 8010 (3,0) (suggested to fulfill statistics requirement)

Research BCHM 9910 (X,0) – up to 9 credits total

Spring Semester:

Seminar BCHM 8250 (1,0)

Elective course*

Research BCHM 9910 (X,0) – up to 9 credits total

Summer (for 12-month assistantship appointments only):

BCHM 9910 (6,0)

Future years:

Subsequent Fall/Spring semesters:

Seminar BCHM 8250 (or BCHM 8510 in last semester) each semester (1,0)

Research BCHM 9910 (X,0) – up to 9 credits total

Summer semesters (for 12-month assistantship appointments only):

Research BCHM 9910 (6,0)

* The Ph.D. degree in Biochemistry & Molecular Biology requires a minimum of 15 hours of coursework. You are required to fulfill a Statistics Requirement for which we suggest STAT 8010. You must complete one additional credit of non-research coursework. Elective course selection needs to be approved by your Advisory Committee. Additional hours required for full time status are fulfilled by BCHM 9910 for Ph.D. students. At least 18 hours of BCHM 9910 are required for the Ph.D. In addition, all students must register for Seminar BCHM 8250 (1,0) each semester enrolled. Full-time status is 9 hours for fall/spring semesters and 6 hours for summer semester. Enrollment during summer semester is required only for 12-month assistantship appointments or for students planning to graduate in summer semester.

Science Elective Courses for the Genetics and Biochemistry & Molecular Biology Programs:

The coursework described within the curriculum comprises a body of information essential for both breadth and competence in a student's field of interest. Core courses in biochemistry and genetics (see above) as well as more specialized courses (see below) are essential for pursuing professional competence in the chosen area. Additional courses may be added to the required courses as the student or the Advisory committee deems appropriate. The following list provides suggestions for elective courses but is not exhaustive. Many of these courses are not offered every year. Check the online course registration for information on offerings in a given term.

BIOL (GEN) 6050: Molecular Genetics of Eukaryotes

GEN 6100: Population & Quantitative Genetics

GEN 6200: Molecular Genetics and Gene Regulation

GEN/BCHM 6400: Bioinformatics

GEN 6500: Comparative Genetics

GEN 6600: Epigenetics

GEN 6700: Human Genetics

GEN 8200: Genomics and Proteomics

GEN 8420: Genetic Data Analysis

GEN 8430: Genomic Technologies and Methods

GEN 8460: Regulatory Genomics

GEN 8480: Genomic Data Management and Mining

GEN 8500: Quantitative Genetics

GEN 8900: Special Topics in Genetics

BCHM 6310: Physical Approach to Biochemistry

BCHM 6320: Biochemistry of Metabolism

BCHM 6360: Molecular Biology: Genes to Proteins

BCHM 6430: Molecular Basis of Disease

BCHM/GEN 8080: Writing Skills Development for Life Science Manuscripts

BCHM/GEN 8090: Writing Skills Development for Life Science Proposals

BCHM/GEN 8200: Genomics and Proteomics

BCHM/GEN 8400: Introduction to Life Science Industry

BCHM 8900: Special Topics in Biochemistry

Other available 6000 or 8000 level GEN or BCHM courses

Other 6000- and 8000-level courses in BIOL, CH, MICR, HORT, PHYS, etc. may also be taken in consultation with the Advisory Committee. Examples are:

STAT 6020: Introduction to Statistical Computing

BIOL 8000: Concepts in Evolution, Ecology and Organismal Biology

BIOL 8010: Concepts in Molecular, Cellular and Developmental Biology

BIOL 8710: Experimental Design and Analysis for Biologists using R

MICRO 8000 Concepts in Microbiology I

MICRO 8010 Concepts in Microbiology II

Any other courses taken outside of those listed/outside of our department, are covered under your tuition waiver (with rare exception).

D. Grade Requirements

Grades of A or B are expected in all courses. A minimum of a B average (3.0 GPA) in all graded coursework listed on the GS2 form is required for continuation in graduate school. A student with a GPA less than 3.0 is placed on probation. A student on probation will be permitted a period of nine graded credit hours (Fall or Spring) to raise a deficient grade point average to 3.0. Summer Semester and P/F course credit hours are not included. However, a grade lower than C in any of the courses found on the plan of study (GS2) will immediately disqualify a student from further graduate study in Genetics or Biochemistry & Molecular Biology.

SECTION VI. SCHOLARLY WORK

The Ph.D. degrees in Genetics and Biochemistry & Molecular Biology are research degrees. While coursework is required to broaden the student's training and to increase his or her professionalism, the primary goal of this coursework is to increase one's ability to do competent research. It is the quality of the student's research that will eventually lead to the award or denial of the desired degree. Following completion of required coursework, duties associated with research will occupy most of a student's time and thought. Unlike courses, research is not structured with well-defined hours. This requires that the students have the proper maturity, mental discipline, and work habits to be independent and productive. Research is **not** done on a forty hour a week basis from 9:00 A.M. to 5:00 P.M., Monday through Friday. It should also be noted that your assistantship requires 20 hours of work for the department (TA) or for the research advisor (RA). This does not include time spent on dissertation research and you are expected to work additional hours to complete your dissertation research.

Ph.D. students should plan to make maximal use of the summer period. It is advisable that after the first academic year, course loads should be kept to a minimum to allow maximum research time. Unlike undergraduate students, graduate students should not view class breaks specified in the university calendar as vacation time. Rather, these breaks from scheduled classes should be seen as invaluable time for performing research.

SECTION VII. ANNUAL LEAVE

Per Graduate School's policies, graduate assistants with 12-month appointments are entitled to the official University holidays accorded to 12-month administrative staff (holiday schedule). Graduate assistants do not accrue leave. Graduate assistants may request up to four weeks of leave without pay per semester and one week of leave without pay per summer session for illness of a close family member, death in the immediate family, or personal illness or hardship. A graduate assistant (of any gender) is eligible for up to six weeks of parental leave. More information about leave can be found in Graduate

School's Handbook. Students must discuss with their Major Advisor and the Department Chair before planning their annual leave to ensure proper arrangements.

SECTION VIII. PH.D. SPECIFIC REQUIREMENTS

Application to enter the program is accomplished by filing an Application for Admission through the Graduate School. Acceptance into the program requires approval of the Genetics and Biochemistry Graduate Committee. Coursework for students who have completed an M.S. will be determined by the student's Advisory Committee and Graduate School Policies, but it should be noted that the Graduate School at Clemson forbids awarding credit for courses already applied to another degree.

A. Candidacy for the Ph.D. Degree (Comprehensive Exam)

Upon completion of the second year but before the end of the fifth semester of graduate work (not including summer semesters), students in the Ph.D. program take a two-part Comprehensive Exam consisting of an original written proposal on the student's own research project and a defense of that proposal before the student's Advisory Committee. The Comprehensive Exam is designed to evaluate the student's overall mastery of knowledge from their coursework and their understanding of their research project, including their critical thinking and ability to articulate, design, and test research ideas.

Passing the Comprehensive Exam and submission of the signed GS5D and GS-Research Approval forms allows the student to enter Candidacy for the Ph.D. Degree. Students must have earned a B in all required courses in the curriculum before taking the Comprehensive Exam. If a student earns a C or below, they must retake the course and earn B or better. Students on academic probation may not take the Comprehensive Exam until they have returned to good academic standing, defined as a GPA of 3.0 or above.

If a Ph.D. student has not completed the Comprehensive Exam by the end of the fifth semester of enrollment (exclusive of summers), their assistantship will be terminated and the student will not be permitted to enroll in BCHM 9910 or GEN 9910 (Doctoral Research) for the sixth semester. Extensions may be granted to students who have experienced significant documented disruptions in the graduate program (e.g., extended illness or family emergencies). Any significant disruption should be relayed to the Graduate Coordinator and Department Chair, who with the Graduate Committee will determine whether an extension will be granted. The request should come from the student but may come from the Faculty Advisor if the student is unable to make the request.

For students who transition from one of our M.S. programs, the Comprehensive Exam shall be completed no later than the end of the third semester after the transition.

The Comprehensive Exam consists of two parts: the written proposal and the oral defense. The first part of the exam is preparation of a written proposal of the student's research plan and the second part is a presentation of that proposal and subsequent discussion and questions by the student's Advisory Committee.

1. Written proposal

The first part of the comprehensive exam is preparation of a written proposal on the student's own research project. The written proposal component of the comprehensive exam is to be the student's

own work, with limited faculty input. This does not preclude the normal guidance faculty advisors provide students in their research on an everyday basis and should not inhibit those interactions.

The student will first prepare a one-page Specific Aims section. The specific aims page should be driven by the student's understanding of their project and be drafted by the student. The Faculty Advisor may provide input on both the development of the specific aims and the writing of the specific aims page. The Faculty Advisor should approve the final specific aims page before the student sends it to the rest of their Advisory Committee. The Advisory Committee has one week to read the specific aims and provide feedback and should indicate their approval in writing to the student and advisor. If the specific aims are not accepted, the Advisory Committee must provide feedback to the Faculty Advisor and student and the student then has one week to submit a revised specific aims page. If the specific aims are rejected again, the student must arrange for a meeting with their Advisory Committee to discuss what actions need to be taken for improvement.

Once the specific aims have been accepted, the student will prepare their full written proposal in the format provided below. The Faculty Advisor may provide limited scientific input on the development of the body of the proposal. The student may ask other students for feedback and proofreading. The proposal is judged on scholarly presentation in English of the background material, preliminary results, and questions being addressed, as well as feasibility and design of the experiments, with appropriate citation of the relevant literature and attention to spelling, grammar, and format.

The proposal must be submitted to the Advisory Committee two weeks before the scheduled oral exam. The Advisory Committee must indicate to the Faculty Advisor and student at least 48 hours before the oral exam that the proposal is satisfactory for the student to proceed to the oral exam. If the proposal is rated unsatisfactory by two or more Advisory Committee members, the oral presentation will be suspended. The student will be given feedback on the deficiencies of the proposal and will have one opportunity to rewrite a proposal that is acceptable to the majority of the Advisory Committee before going forward. This rewrite must be completed within two weeks of receiving feedback. If the original or revised proposal is accepted by the majority of the Advisory Committee, the student can proceed to the oral exam and committee members can address issues in the proposal then. If the student passes the oral exam, Advisory Committee members can still ask for a correction of the proposal for minor items within a month of the oral defense before signing the GS-Research Approval form.

It should be noted that approval of the specific aims or proposal or acceptance of resubmitted documents does not imply that the student has passed this part of the comprehensive exam, only that the student is approved to progress to the next stage (preparation of the proposal or the oral exam, respectively).

Students may use AI during preparation of their proposal but must provide a separate declaration of how AI was used.

2. Format of the written proposal

The written proposal should have the following standard format:

- 1" margins
- Font: Arial 11 point or Times New Roman 12 point
- Single-spaced
- Limit is 1-page Specific Aim + 12 pages main text
    - This includes all tables and figures but does not include references

- The proposal is judged by content, not length, and it is not necessary to fill the page limit if not needed

The following sections must be included:

- Specific Aims (1 page, separate from the rest of the proposal)
  - Introductory paragraph
  - Central hypothesis paragraph – what big question are you investigating
  - Two or three specific aims
    - For each specific aim include a title for the aim and a short description
  - Expected outcomes paragraph
- Background and Significance
- Preliminary Results
- Research Strategy
  - Experimental design
  - Expected results
  - Pitfalls and alternative approaches
- References (not included in the page limit)

More information on how to write a Specific Aims page can be found at the following two links:
https://www.biosciencewriters.com/nih-grant-applications-the-anatomy-of-a-specific-aims-page.aspx
https://www.uab.edu/medicine/cfar/images/How_to_Write_Specific_Aims_Page.pdf

3. Oral defense of the proposal

The oral portion of the comprehensive exam (presentation and defense of the research proposal) should also be the student's own work. The Faculty Advisor may provide help in preparation of the proposal presentation as well as feedback during practice sessions prior to the oral section of the comprehensive exam.

On the day of the oral exam, the student will present and defend the research proposal to their Advisory Committee. Advisory Committee members may ask ANY questions required to assess the student's background knowledge of the discipline, ability to plan research that will address the posed specific aims, the appropriateness of the specific aims, the student's understanding of the benefits and limitations of the experiments proposed, and consideration of alternative approaches. The Advisory Committee and student should plan 2-3 hours for the oral exam.

The Advisory Committee will determine successful completion of the oral portion on the day of the exam. At the conclusion of the exam, the student will be asked to leave the room and the Advisory Committee will deliberate the outcome (Pass/Fail). A majority of the Advisory Committee must agree to Pass. If the student has passed both the written and oral portions of the exam, the Advisory Committee will sign the GS5D and the GS-Research Approval forms to be submitted to the Graduate School. If corrections to the proposal are still needed, the GS-Research Approval form should be held until the revised proposal is approved. Upon successful completion of both parts of the Comprehensive Exam and submission of the GS5D and GS-Research Approval forms, the student becomes a Candidate for the Ph.D. degree.

If less than a majority of the Advisory Committee agrees that the student has passed the oral exam, the student may be given a second opportunity if recommended the majority of the Advisory Committee. The student may be allowed only one repeat of the oral exam, which must take place a minimum of two months and a maximum of three months from the date of the initial oral exam. The Advisory Committee will provide feedback on the deficiencies resulting in failure of the first oral exam.

If the student fails their second attempt in passing the oral exam, the student will be removed from the Ph.D. program. The student may opt to transfer to the non-thesis M.S. program but the assistantship will be terminated. Transfer to the thesis-based M.S. program requires approval of the Advisory Committee and the faculty advisor. Support on an assistantship as a M.S. student is not guaranteed.

If the student passes the comprehensive exam but a deficiency is identified in the student's graduate training, the Advisory Committee may require the student to take additional courses or training. This should be noted on the GS5D form and a revised GS2 form must be submitted in a timely manner.

Alteration of the Advisory Committee composition will only be allowed prior to initiation of the written exam or after successful completion of both the written and oral exams.

4. Timing of the components of the comprehensive exam

Week 0: Submission of specific aims by the Advisory Committee

Week 1: Approval of specific aims by the Advisory Committee

- The Advisory Committee must approve or reject the specific aims within one week of submission
- If the specific aims are not approved on first submission, the Advisory Committee must provide feedback to the student and Faculty Advisor. The student should meet with the Faculty Advisor to discuss this feedback and will have one week for resubmission of the specific aims.
- The student may begin preparation of the proposal upon approval of the specific aims.

Week 4: Proposal due to the Advisory Committee

- Students have three weeks from acceptance of the specific aims to prepare the full written proposal. This should be done with limited input from the Faculty Advisor.
- The submitted proposal must follow the guidelines provided above. Failure to follow the guidelines may result in the proposal being returned.
- The proposal must be sent to the Advisory Committee at least two weeks before the scheduled oral exam.

Weeks 5-6: Approval of the proposal by the Advisory Committee

- The Advisory Committee must approve or reject the proposal at least 48 hours in advance of the scheduled oral exam.
- If the Advisory Committee does not approve the written proposal, the oral exam will be cancelled. The student has two weeks to revise and resubmit the proposal based on feedback provided by the Advisory Committee. The oral exam with be rescheduled based on when the revised proposal is submitted.

- The student will progress to the oral exam upon approval of the first submission or upon resubmission of the revised proposal.

Week 6: Oral defense

- The student will give an oral defense of the written proposal in which the Advisory Committee may also test general knowledge from the student's coursework.
- If the student fails the oral exam, they may request a second attempt. This second attempt must be completed within 3 months of the first oral defense. The Advisory Committee may require submission of a new or revised written proposal.

B. Ph.D. Dissertation and Oral Defense

The student must prepare a Ph.D. dissertation describing the original research accomplished and the results obtained. The research must be of publishable quality and at least a portion of the research is expected to be submitted for publication for award of the Ph.D. degree. In addition, the dissertation must be of such quality that the student has shown the skill and knowledge to be awarded such a degree. When the dissertation has met the approval of the student's Major Advisor, the student will present his or her research before the public and defend the research before the Advisory Committee and all faculty who wish to attend in a private oral examination (in conjunction with GEN/BCHM 8510 Dissertation Seminar described below). The date, time, location, and abstract of the public defense must be provided to the Departmental Administrator and the Graduate School at least 14 days (10 business days) in advance of the defense date.

In addition to the notification of the Graduate School and the Advisory Committee members, the date, place and time of the oral defense will be posted in the departmental office. A copy of the dissertation must be submitted to each member of the student's Advisory Committee and a copy left on file in the Departmental office at least two weeks prior to the final oral examination/defense. Deadlines for the oral defense and submission of the final dissertation to the Graduate School are given in the Graduate School Announcements (**see Section XII. Checklist of Important Events**).

The Major Advisor facilitates the examination process but does not play a major role in the examination. If the student fails the oral dissertation exam, they will be permitted one re-examination at a time agreed upon by the Advisory Committee (no more than six months later). If the student fails Their second attempt in passing the oral dissertation exam, they will be dismissed from the Genetics/Biochemistry and Molecular Biology graduate programs.

Deadlines:

1. Deadlines set by the university for thesis/dissertation distribution will be strictly enforced. If the deadline for submission of the advisor-approved dissertation to the committee is not met, the defense will be cancelled and must be rescheduled.

Note: if cancellation of the defense results in a student's GS7 form being delayed beyond the grad school deadline, the student will not graduate that semester. If all requirements are met by the end of the semester, the student will not have to register for credits the next semester to graduate. International students should confer with the International Office on how to maintain their legal status in the US.

2. The advisor must have the draft dissertation/thesis at least two weeks before it is due to the committee. The advisor will read and return the draft with suggested edits within 7 days of receipt. The advisor must approve the edited draft before it is sent to the committee.
3. Students should have a final committee meeting by the middle of the semester before the anticipated graduation. At this meeting, the student will provide an update on their research as well as a final overview of the entire project. The committee can then discuss any final work to be done and give their concurrence that the student is ready to write their dissertation and sign up for graduation. A (tentative) defense date and timeline should also be established at this meeting.

Adherence to these policies is the shared responsibility of the student, the advisor, and the department. Students, advisors, or committee members should contact the graduate committee if problems arise.

C. Time Requirements and Financial Support

Completion of the requirements for the Ph.D. degree typically takes five to six years but may be less for students already holding an MS degree. The Graduate School requires that all work towards the degree be completed within six years after Candidacy (filing the GS5D form).

Departmental financial support for students on teaching assistantships is based on the quality of teaching and progress toward the degree and is reviewed annually by the Department Chair and the Graduate Committee. Departmental support beyond five years for students earning a Ph.D. degree without holding an M.S. must be approved on a semester-by-semester basis by the Department Chair and the Graduate Committee. If the student seeks a Ph.D. after obtaining the M.S., departmental support beyond four years is rare and must be approved on a semester-by-semester basis by the Department Chair and the Graduate Committee.

SECTION IX. SEMINAR PARTICIPATION

A. Departmental Seminars (GEN 8250 or BCHM 8250)

When the student enters graduate school, they are entering the scientific profession. Part of professional training involves continual expansion of the student's areas of knowledge and keeping abreast of current advances in respective fields. The department provides a schedule of scientific speakers from within and outside Clemson University to aid this process. Whenever possible, the department provides the student with the opportunity to meet informally with the visiting speakers. Students are

strongly encouraged to use this opportunity to best advantage. Contacts made during this time can be of great importance in the student's professional life.

All graduate students in Genetics and Biochemistry & Molecular Biology must enroll in the seminar course (GEN 8250 or BCHM 8250) each Fall and Spring semester in which they are a full-time student in the degree program. Attendance by all graduate students in Genetics and Biochemistry & Molecular Biology at Departmental Seminars and at the Graduate Research Symposium (described below) is mandatory. **Absence from more than 20% of departmental seminars or the Graduate Research Symposium will result in an F in GEN/BCHM 8250 and immediate dismissal from the Genetics/Biochemistry & Molecular Biology graduate programs.** Any exception must be approved in advance by the Major Advisor and the Department Chair.

Genetics and Biochemistry & Molecular Biology graduate students being trained by Genetics and Biochemistry faculty at off-campus locations shall not be required by virtue of their location to fulfill additional obligations beyond those specified in the handbook. This does not preclude voluntary participation, but mandatory requirements are the same for all students in the department regardless of physical location.

B. Graduate Research Symposium

All Ph.D. students are required to present posters and formal seminars during their residency. The Graduate Research Symposium, which is separate from the departmental seminar series, was created to give students more opportunities to present their own research and gain experience in giving poster presentations and formal seminars. These symposia showcase the excellent work of students while facilitating interactions and potential collaborations. First-year students are not expected to give presentations outside of those assigned in their courses. Each year thereafter, students will be required to give a presentation as part of the Graduate Research Symposium series as planned below:

Fall Schedule:

BMB Students in Years 4 and beyond – Present a 17-minute talk with 3 minutes for questions
All other students (BMB and GEN) – Attend

Spring Schedule:

GEN Students in Years 4 and beyond – Present a 17-minute talk with 3 minutes for questions
BMB and GEN PhD students in Years 2 and 3 – present a research poster
BMB and GEN MS students in Year 2 – present a research poster
All other students (BMB and GEN) – Attend

These presentations will be on a student's own research, as described below, and fulfill part of the Ph.D. degree requirements. Ph.D. students are required to give a minimum of one presentation per year on their research in progress, and one as a final research report as part of the dissertation defense (the final defense may count as the Graduate Research Symposium presentation for that year). **Please note that after the first year, each student will be scheduled to give a Graduate Research Symposium presentation (poster or seminar) every year on the student's own research, but second year students may present more of an overview.** More presentations may be assigned at the discretion of the student's Advisory Committee.

Mandatory attendance at both the Graduate Research Symposiums and the departmental seminar series is required to pass GEN/BCHM 8250. Absence from more than 20% of departmental seminars or the Graduate Research Symposium (combined) will result in an F in GEN/BCHM 8250 and immediate dismissal from the Genetics/Biochemistry & Molecular Biology graduate programs. Any exception must be approved in advance by the Major Advisor and the Department Chair.

Graduate Research Symposium Presentation Content

Ph.D. students (except first year students) will give a presentation in the Graduate Research Symposium each year (except for the final semester in which the student is enrolled in GEN/BCHM 8510 and the research presentation is given as part of the thesis/dissertation defense). These presentations should be used to introduce your area of research, your specific project, and the progress you have made thus far. As students prepare and present their talks, they should consider the following questions:

Introduction

1) Why is this research important? Put things in context for a general scientific audience. Remember, your audience has general biochemistry and genetics knowledge but may not have specific knowledge of your subject area.
2) What is already known about your specific subject area (setting up the question)? You may use other people's figures and data, including past research in your lab, but must properly cite/acknowledge the sources.
3) What is/are the question(s) your research addresses?

Preliminary Data/Methods

1) Explain the techniques you are using. Standard molecular biology techniques (e.g., PCR, Northern blot, Southern blot, PCR) do not need explanation, but special nomenclature or techniques should be explained so your audience will be able to better understand your scientific findings.

2) Explain the experiments you have done so far. Why did you do them? What were the results? Do the results make sense given what is known or what your hypothesis is? Are there problems you are trouble shooting? Walk your audience through your thought processes in performing and evaluating your experiments.

Future Experiments

1) What new questions are raised by your results? How do you plan to address them?
2) What other questions still need to be addressed? How do you plan to do that?

Summary

1) Review your questions and your progress toward answering them. A bullet slide or two is all that is usually needed.
2) Review your future directions.
3) Thank the audience and ask for questions.

Special tip:

Remember to speak slowly and with enough volume to be heard throughout the room. This may require some concentration on your part, as inexperienced speakers often start out strong but tend to become quieter over the course of the presentation.

C. Dissertation Seminars (GEN//BCHM 8510)

All students are required to give a final presentation of their dissertation work as a regular 45 minute defense seminar. The Advisory Committee and student will decide when to hold the actual dissertation defense, and the defense and public presentation do not need to be on the same day. Adequate notice of defense (minimum of 14 calendar days) must be given to the Departmental Administrator so that proper notice can be given to the Graduate School and department faculty.

SECTION X. DISSERTATION PREPARATION

Students should review the formatting rules for dissertations from the Graduate School before writing the first draft of the dissertation. A checklist and detailed FAQs addressing common issues in formatting are available online at https://www.clemson.edu/graduate/students/theses-and-dissertations/index.html. The rules and formats prescribed by the University are rigidly enforced by the Graduate School and final submission requires electronic conversion to a pdf file. Also, journals such as the Journal of Biological Chemistry, Biochemistry, Genetics, Cell, and others, recommend that writing manuals such as Strunk's Elements of Style or the American Chemical Society's Guidebook for Authors be consulted for proper form. The English Department's Writing Support Center offers assistance in writing to students for whom English is not their native language, as well as to any Clemson student who requests it.

The following rules govern the citation of references in a thesis or dissertation:

1. References will be cited as done in a leading journal of biochemistry, molecular biology, or genetics and agreed upon by the Advisory Committee and must include the full title of an article.
2. If journals are to be abbreviated, they must conform to standard abbreviations.

When a student has prepared a draft, the student should consult with their Major Advisor. The draft should be re-written with appropriate changes and the procedure repeated as many times as necessary. The dissertation must be in essentially final form for the oral examination: graphs should be in finished form with complete captions and the text of the final draft typed with special care. It should be understood that if there are no additions or corrections, as a consequence of the oral examination/defense, this copy of the dissertation could be considered the final draft. A prudent candidate will have consulted the Advisory Committee members and the Graduate School with respect to the text and format of their dissertation before the oral defense to anticipate any major alterations. As noted previously, a copy of the dissertation must be submitted to each member of the student's Advisory Committee at least three weeks before the final oral examination/defense and a copy left on file in the departmental office. Additions, deletions, or alterations may be suggested or required at the oral examination/defense.

The Genetics and Biochemistry faculty ***strongly*** disapproves of students leaving residency in the Clemson area before the successful completion of the thesis or dissertation. Completion by email is a time consuming, difficult process and generally results in a less than optimum quality thesis.

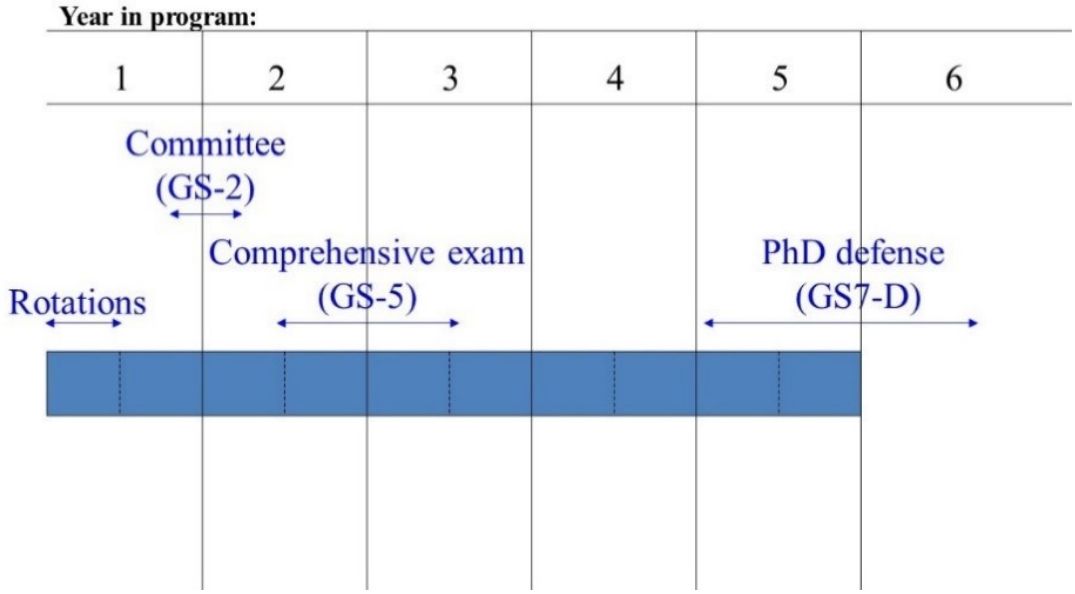
SECTION XI. CHECKLIST OF IMPORTANT EVENTS

Task	**Timing of task**
Select Major Advisor	RAs: Before admission. TAs: By the end of the first semester of enrollment. Can be changed but may have consequences for financial support.
Select Advisory Committee	Not later than the end of the first year of enrollment.
Submit GS2 Plan of Study form	By the third semester of enrollment.
Meet with Advisory Committee	Yearly.
Comprehensive Exam for admission to candidacy for PhD degree	Preparation and oral defense of original research proposal is normally performed after the

(Forms GS5D and GS5-Research Approval)	completion of the formal course requirements in the GS2 plan of study, usually after the second year. Special exemption is required for postponement past the 5th full semester of enrollment.
Present dissertation research to department	Every year after the first, in the Graduate Research Symposium.
Meet with Advisory Committee to discuss dissertation writing and defense	5-6 months before graduation date*
Apply for graduation and diploma order (through iROAR)	The beginning of the final semester before graduation*.
Order cap, gown, and hood	About three months before graduation*
Submit dissertation draft to Major Advisor for revisions, comments, and approval	10-11 weeks before graduation date*
Submit advisor-approved dissertation to Advisory Committee	8-9 weeks before graduation date*
Submit Defense Schedule Notice and place dissertation in departmental office	Two weeks (10 business days) before the oral defense date
Oral defense of dissertation	5-6 weeks before graduation date*
File Form GS7D	~3-4 weeks before graduation date* (the specific date is published by the Graduate School)
Submit the completed dissertation to the Manuscript Review Office	~1 week after GS7D due date
GRADUATION!!!!!	

*Formal deadlines for applying to graduate, filing the GS7D form, and submission of the final dissertation to the Manuscript Review Office are posted by the Graduate School and are keyed to graduation dates in December, May, and August (https://www.clemson.edu/graduate/students/deadlines.html). These deadlines are immutable, so it is wise to check early.

SECTION XII. TIMETABLE FOR GRADUATE DEGREES



SECTION XIII. ADDITIONAL INFORMATION

A. Academic Integrity

Clemson University has an official policy on academic integrity. "As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a 'high seminary of learning.' Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form." Because there are serious consequences for any instance of plagiarism or misconduct, including suspension from the degree program, students are advised to become familiar with the Clemson Graduate Academic Integrity Policy (https://www.clemson.edu/graduate/files/pdfs/policyhandbook_2021-22.pdf).

Research, the creation of new knowledge, and the membership of a young scientist into the ranks of other scientists engaged in research activities, involves special aspects of truthfulness, honor, responsibility, trust, and respect. We direct students to the National Academy of Sciences online book (the pdf is a free download) On Being a Scientist: Responsible Conduct in Research (http://www.nap.edu/catalog.php?record_id=12192) for guidelines and discussions of these matters. Students should consult with their Advisory Committee chair or the chair of the department if they encounter any practices that seem questionable or have any doubts about what appropriate practices are in

collecting and reporting data. During graduate training, students will be given opportunities to discuss these matters in some detail with experts in ethics and appropriate practices in research.

B. University Ombudsman

The ombudsman is an independent, confidential resource that provides assistance to faculty and graduate students in resolving problems, complaints, and conflicts when normal processes and procedures have not worked satisfactorily. The Ombudsman's Office serves as a central information source on policies, procedures and regulations affecting faculty and graduate students. The office refers individuals to persons able to resolve problems or handle appeals at the lowest possible level. Where appropriate, the ombudsman can facilitate and/or mediate communication between parties who find themselves in a dispute. More information about the functions of the ombudsman can be found at http://www.clemson.edu/administration/ombuds/. Concerns can be directed to the university ombudsman for faculty and graduate students by letter, walk-in, appointment, or telephone:

201 West Cherry Road
Seneca, SC 29678
Phone: 864-656-4353

C. Resources for Graduate Students with Special Needs

For graduate student research and coursework:

Student Accessibility Services (SAS)
http://www.clemson.edu/academics/studentaccess/studentresources.html
Suite 239 Academic Success Center Building
864-656-6848
Margaret Camp, Director mmcamp@clemson.edu
What to do: Meet with someone from Student Accessibility Services to disclose disability and discuss possible accommodations. Provide documentation of disability (contact SAS for guidelines).

For graduate students who struggle with executive functioning:

Academic Success Center http://www.clemson.edu/asc/
864-656-6452
What to do: Set up meeting with Academic Coach, if necessary. An academic coach can help with difficulties with executive functioning: social skills, self-direction, self-awareness, etc.

D. Other Sources of Support/Advice

1. Graduate Student Resources Page (https://www.clemson.edu/graduate/students/resources.html)
2. Graduate School Survival Guide (http://faculty.washington.edu/wpratt/survive.htm)
3. How to Be a Good Graduate Student (http://www.cs.indiana.edu/how.2b/how.2b.html)

E. Annual Survey Form

All graduate students are required to complete an annual survey form and submit needs to be updated by July 1 each year and emailed back to the graduate committee. The survey form will be sent via email to the students about a month before the deadline.