



## I. GUIDELINES FOR GRADUATE EDUCATION

Two sets of guidelines are provided for graduate study in the Department of Biochemistry:

- The **Graduate School** has general guidelines, which are found in the document [\*Expectations for Graduate Education\*](#).
- The **Department of Biochemistry** guidelines, which are outlined herein.

## II. OVERVIEW OF DOCTORAL DEGREE REQUIREMENTS

### Graduate School

- Complete **90 credits of graduate study**.
- This must include **30 graded credits** (*i.e.*, from coursework).
- Pass the **preliminary examination** and **dissertation defense**.
- Complete the **ethics and research integrity training**.

### Biochemistry Department

- Successfully complete **five core courses** and **two specialized courses** during their first two years.
- Maintain a **cumulative GPA of 3.0** or above in all coursework.
- Enroll in three **laboratory rotations** during the first semester
- Enroll in two **seminar courses** while registered in the doctoral program.
- Serve as **Teaching Assistants** for Biochemistry courses for two semesters during the first two years.
- Pass a **Qualifying Exam** at the end of the Spring semester of the first year.

## III. COURSEWORK

### Core Courses (taken by all Biochemistry graduate students in the first year)

Fall: BCHM 5224 Protein Structure and Function  
 BIOL 5884 Molecular Biology of the Cell  
 ALS 5324 Research Ethics in Agriculture and Life Sciences

Spring: BCHM 5784 Advanced Applications in Molecular Life Sciences  
 and **one** of:  
 BCHM 5024 Computational Biochemistry for Bioinformatics  
 BCHM 5984 Integrated prokaryotic/eukaryotic gene regulation

Specialized Courses

Two additional courses will be taken in the second year. Students should confer with their Major Professor and Advisory Committee to select the most appropriate courses. Students are strongly encouraged to complete all course requirements by the end of year 2.

Below are some graduate-level courses that may be of interest. See also [a complete list of graduate courses by department](#).

BCHM 5024 Computational Biochemistry for Bioinformatics (if not taken in first year)  
 BCHM 5984 Integrated Prokaryotic/Eukaryotic Gene Regulation (if not taken in first year)  
 BIOL 5124 Biomacromolecular Structure  
 BIOL 5184 Prokaryotic Recombinant Proteins  
 BIOL 5214 Biomacromolecular Structure  
 BIOL 5424 Computational Cell Biology  
 BIOL 5624 Advanced Microbial Genetics  
 BIOL 5634 Microbial Physiology  
 BIOL 5674 Advanced Pathogenic Bacteriology  
 BIOL 5844 Advanced Proteomics and Biological Mass Spectrometry  
 BSE 5624 Enzyme Engineering  
 BMVS 6724 Molecular Mechanisms of Pathogenic Bacteria  
 PPWS 5524 Advanced Plant Physiology and Metabolism I

Seminar Courses

Students will enroll in one-credit seminar classes while they are registered in the doctoral program:

BCHM 5004 Seminar in Biochemistry (Spring)

In some cases, the seminar course BIOL 5174 Seminars Across the Sciences may be a suitable substitution for BCHM 5064 for advanced graduate students. Advisory Committee approval is required.

Professional Development Courses

There are a number of professional development courses that may be of interest. Students should confer with their Major Professor and Advisory Committee to decide whether one of these might be beneficial.

BIOL 5154 Exercises in Grantsmanship  
 GRAD 5104 Preparing the Future Professoriate  
 GRAD 5114 Contemporary Pedagogy

See all professional development courses offered by the Graduate School: [Transformative Graduate Education](#)

Research and Dissertation

BCHM 7994 Research and Dissertation

The number of credits of BCHM 7994 is such that a total of 12 credits is taken per semester as required for full-time status (see schedule on next page). These credits contribute to the 90-credit graduate study requirement.

**Summary of the courses satisfying the requirement for 30 graded credits**

	# Courses	Total Credits
Core and specialty courses	7	19
Seminar courses	3	3
Rotations	2	8
<b>Total</b>		<b>30</b>

Notes on Course Requirements

- Graded course work on the Plan of Study must be taken for an A/F grade unless the course is only offered P/F. Courses offered P/F can be used to meet the 30 credit minimum, as long as these courses are **only** offered P/F.
- At least 27 graded credits must be at the 5000 level or higher.
- The 5000-level course work may include a maximum 18 credits total in 5974, 5984, and 6984 courses and 4 credits of seminar.
- The Plan of Study may include a maximum of **six** credits of Virginia Tech graded 4000 level undergraduate course work. The six credits of Virginia Tech 4000 level course work may include Special Study (4984) but may not include Undergraduate Independent Study (4974) or Undergraduate Research (4994) courses.
- Students who are not serving as teaching assistants during the first three semesters, during which they are supported by the department, are required to take an additional 3 credit graduate level course. This course will count towards the two required specialized courses.

**Typical Schedule for a Biochemistry Doctoral Student**

	Fall	Credits	Spring	Credits
Year 1	<b>BCHM 5004</b> Biochemistry Seminar	1	<b>BCHM 5004</b> Biochemistry Seminar	1
	<b>BCHM 5224</b> Protein Struct & Fxn	3	<b>BCHM 5784</b> Adv Applic in Mol Life Sci	3
	<b>BIOL 5884</b> Mol Bio of the Cell	3	<b>BCHM 5064</b> VTLSS Seminar	1
	<b>BCHM 5014</b> Rotations	4	<b>BCHM 5024</b> Comp Biochem & Bioinf <b>OR</b>	3
	<b>ALS 5324</b> Research Ethics in Ag & Life Sci	1	<b>BCHM 5984</b> Int Prok / Euk Gene Reg	
			<b>BCHM 5014</b> Rotations	4
	<b>Total</b>	<b>12</b>	<b>Total</b>	<b>12</b>
Year 2	<b>BCHM 5004</b> Biochemistry Seminar	1	<b>BCHM 5004</b> Biochemistry Seminar	1
	<b>XXXX XXXX</b> Specialty course	3	<b>XXXX XXXX</b> Specialty course	3
	<b>BCHM 7994</b> Research & Dissertation	8	<b>BCHM 7994</b> Research & Dissertation	8
	<b>Total</b>	<b>12</b>	<b>Total</b>	<b>12</b>
Years 3+	<b>BCHM 5004</b> Biochemistry Seminar	1	<b>BCHM 5004</b> Biochemistry Seminar	1
	<b>BCHM 7994</b> Research & Dissertation	11	<b>BCHM 7994</b> Research & Dissertation	11
	<b>Total</b>	<b>12</b>	<b>Total</b>	<b>12</b>

## IV. RESEARCH ROTATIONS

Rotations are an opportunity for students to learn about the diversity of research in the department and help inform the selection of a mentor.

### General Information

- First-year students conduct three ~4-week rotations.
- See the Table below for due dates for rotation selection and for begin and end dates for each rotation.
- Students will give brief presentations (15 minutes for the presentation and 5 minutes for discussion) **at the end of two of their rotations** as part of the weekly seminar series. Students will be notified at least three weeks in advance of their scheduled date to present.
- **For the rotation for which they do not give a presentation**, students are expected to write a short journal “note” or research report. Students should discuss an appropriate format with their advisors. Example formats include [FEBS Letters](#), Rapid Reports format of [Biochemistry](#), and [BMC Research Notes](#). Reports should be submitted to rotation advisors by the last day of the rotation.
- **Register for BCHM 5014 as PASS/FAIL.** The decision to give a “passing” grade will be made jointly by the rotation mentor and the Graduate Committee and is based primarily on day-to-day performance in the laboratory. Rotation mentors provide detailed feedback in a formal evaluation letter that is included in the student’s file.

### Selection of Major Professor

After discussions with faculty of interests, students should submit a ranked list of preferences for their major professor to the Graduate Committee rotation coordinator by the date indicated in the Table below. Students may choose to work with faculty other than those with whom rotations were performed. Every effort will be made to place students according to their preferences given the resources available.

Students who matriculate through the Department of Biochemistry may rotate with approved faculty in other departments. **However, if a student selects a major professor outside of the Biochemistry Department, he/she may be required to join the home department of that faculty member and thus be subject to the policies and practices of that department.**

**2015-16 Rotations: Important Dates**

Rotation	List of labs due on (by 5 pm)	Begins	Ends	Presentation
<b>First</b>	08/22/2016	08/24/2016	09/16/2016	09/19/2016
<b>Second</b>	09/16/2016	09/21/2016	10/14/2016	10/17/2016
<b>Third</b>	10/14/2016	10/19/2016	11/18/2016	11/28/2016
<b>Selection of Major Professor</b>	11/18/2016			

## V. QUALIFYING EXAM

To complete the Qualifying Exam, students will write and orally defend an original research proposal that is unrelated to the student's doctoral research. This proposal will follow the same guidelines outlined below for the Preliminary Exam (see section VIII) **except** that the proposal will be limited to 5 pages. **Students must successfully complete this requirement by the end of Spring semester of the first year.** The written portion of the proposal will be completed as part of the course requirement for BCHM 5784. The instructor for this course will arrange for the oral defense of the proposal.

Failure of the Qualifying Exam is not by itself a cause for expulsion from the program. Rather, the Graduate Committee will consider the totality of the student's academic record and will reach a decision regarding continuation of the student in the program.

## VI. TEACHING

All doctoral students serve as teaching assistants for two semesters, usually during the first three semesters. Students will be notified of their assignment no later than one week before the start of the upcoming semester. For each course, TAs will be responsible for at least **one meaningful teaching experience** beyond preparing materials and grading student work. Examples include leading a discussion, giving a guest lecture or leading a help session for working on problem sets and/or preparing for exams.

The goals for the TA assignment are primarily for students to:

- Develop teaching and communication skills, and
- Support the implementation of undergraduate courses, especially courses that enroll many students (large lecture courses) or that require significant time or effort to prepare materials (lab courses).

## VII. ETHICS AND RESEARCH INTEGRITY (E&RI) TRAINING

Commission on Graduate Studies and Policies Resolution 2012-13B mandates that "the Program of Study for all graduate students show a record of the student's participation in the particular ethics and integrity activities delineated by the student's program, department, or college, as part of the student's graduation requirements."

**This requirement came into effect for students matriculating in Fall 2014.**

### Required components

1. ALS 5324 Research Ethics in Agriculture and Life Sciences
2. BCHM 5784 Advanced Applications in Molecular Life Sciences
3. GRAD 5004 GTA Training Workshop

Additional research-specific ethics training (*e.g.*, in treatment of animals or human subjects research) may be required by the student's Advisory Committee.

### Implementation

The Department of Biochemistry will ensure the implementation of the ethics and integrity training component in the education of our graduate students in the following ways.

- The E&RI Training Plan will be provided to incoming graduate students during Orientation Week, which takes place the week prior to the start of classes. The Graduate Director will discuss the requirements with the students.
- At the first meeting with their Advisory Committee, graduate students will describe their progress in satisfying the E&RI training requirements and will outline a plan for completing any outstanding requirements. The Committee will also determine whether any additional training is required on the basis of the student's research plans.
- The Advisory Committee will confirm that students have completed all required elements of the E&RI Training Plan prior to defense of the thesis.
- Completion of the E&RI training requirement will be documented on the student's Plan of Study.

## VIII. DISSERTATION RESEARCH

### Advisory Committee

In consultation with their Major Professor, students should select members of their Advisory Committee by considering whose expertise would be most relevant to the student's research. The Advisory Committee for doctoral students requires a minimum four faculty, of whom three must be affiliated with the [Biochemistry Department](#) (either departmental or adjunct faculty). The Major Professor serves as the Chair of the Advisory Committee. **The committee should meet within three months of selection of the Major Professor.** The Graduate Committee will serve in an advisory capacity for students prior to their selection of a Major Professor.

An annual meeting with the Advisory Committee is mandatory. More frequent meetings may be scheduled as desired by the student and/or Advisory Committee. **Before each meeting, a written summary of the student's research progress must be submitted to the Advisory Committee no later than one week ahead of the meeting time.** An exception to this requirement is made for the first meeting with the Advisory Committee.

### Plan of Study

The Graduate School requires all graduate students to submit a valid [Plan of Study](#). **Each student should begin to prepare his/her Plan of Study at the end of the first academic year.** Students should use the worksheet available from the department office and seek the assistance of their Major Professor. The Plan of Study must then be presented to and approved by the student's Advisory Committee, including a projected date for taking the Preliminary Examination. The Plan of Study and the projected date for the Preliminary Examination are then submitted to the Department Head and the Graduate School for review and approval. Department staff submit the Plan of Study to the Graduate School electronically.

### Preliminary Examination

In order to advance to candidacy, students must pass a Preliminary Exam consisting of an oral defense of a written original research proposal. The purpose of this Exam is to determine whether a student has sufficient depth and breadth of understanding to propose, execute and defend their dissertation research project.

### *Scheduling the Preliminary Exam*

The Preliminary Exam must be scheduled with the Graduate School using the [online form](#). **The Exam must be scheduled by the end of the second academic year** (*i.e.*, by the first week of May).

### *Preliminary Exam Committee*

In the Biochemistry Department, the Major Professor is not part of the Preliminary Exam Committee. Because the Graduate School requires that the doctoral Preliminary Exam Committee have four members, the Chair of the Preliminary Exam Committee is selected outside of the Advisory Committee. Before the Preliminary Exam, the student should make a request to a faculty member to serve as the Chair of the Exam Committee. The request should then be sent to the Graduate Program Director.

### *Written research proposal*

- Students prepare a **10-page original research proposal** based on their dissertation project.
- The proposal can be formatted according to National Institutes of Health or National Science Foundation guidelines (except for length) and must include descriptions of the significance, background, impact, and research plan of the project. Research plans should include the underlying rationale, significance, experimental design, anticipated results, alternative hypotheses or explanations, and potential problems as well as how problems will be addressed (*i.e.*, back up plans). While proposals may include preliminary results, this section should be kept to a minimum (around one page) with the bulk of the proposal focused on describing plans for completing the dissertation research.
- The writing of the proposal must be original. Students should avail themselves of all available resources but **cannot copy verbiage from any grant proposals or manuscripts written by others**. If there is a connection between the student's research proposal and work that the advisor has proposed, the student's research aims and proposed activities should build on and move beyond those of the advisor. The role of the major advisor is to discuss with the student his/her research goals and objectives, principles of experimental design and techniques, and elements of good scientific writing. The advisor should not author verbiage for the student.
- **Three weeks prior** to oral examination, proposals must be submitted to the committee for determination of whether the proposal is satisfactory for oral defense. The Exam Committee Chair will consult with the Major Professor and decide whether the student can proceed with the oral exam. Minor issues can be corrected and the proposal redistributed prior to oral exam. Substantial issues that require considerable rewriting may require rescheduling of the oral exam.
- The final document must be distributed to the Exam Committee **one week prior to the oral exam**.
- Except in extraordinary circumstances, a student who misses a distribution deadline will need to reschedule the oral exam.
- Except in extraordinary circumstances, a student who fails to make timely progress in completing both aspects of the Preliminary Exam will have this issue noted in an annual or semi-annual evaluation and will be at risk of dismissal from the program.

*Oral Exam*

- Students should prepare a brief (~10 minute) overview of their proposal.
- Committee members will question the student with the research proposal as a starting point. Questions will focus on assessing the student’s ability to design experiments, interpret experimental results and recognize alternate approaches should the main strategy fail.
- Discussion will not be limited to the research proposal. Members of the Exam Committee may pursue whatever other areas they feel are necessary to evaluate the abilities and knowledge of the student, including topics addressed in the coursework the student has completed.
- Based on a student’s performance during the exam, the committee will recommend: (a) advancement to candidacy; (b) conditional advancement contingent upon completion of recommended coursework or individual study; or (c) failure. In the event of failure, a second Preliminary Exam must be scheduled during the semester immediately following the first attempt.
- Students are allowed a maximum of two opportunities to pass the Preliminary Exam.
- The Exam Committee Chair will provide a letter to the student describing the outcome of the exam, summarizing the strengths and weaknesses of the student’s performance, and articulating the committee’s recommendations regarding the student’s future work. The letter is sent to the student with copies sent to the Major Professor and the Biochemistry Department for inclusion in the student’s file.

Timeline for Completion of Qualifying and Preliminary Exams

Year	Fall	Spring
1		<b>Qualifying Exam</b>
2		<b>Preliminary Exam</b>
3	Retake <b>Prelim exam</b> if necessary	

Annual Evaluation

As required by the Graduate School, the Major Professor will submit a written annual evaluation of the student’s progress. The evaluation will be distributed to the Graduate Program Director, the Graduate School, members of the Advisory Committee and the student.

Publications

Students are expected to publish their research in peer-reviewed, professional journals. Therefore, students should have published their research, or should provide the Major Professor a manuscript(s) in the appropriate format for publication, prior to the time of graduation.

Research Presentations

After passing the Preliminary Exam and before the Thesis Defense, **students are required to give two oral presentations on their research**. This may be fulfilled by giving two presentations in BCHM 5004: Seminar in Biochemistry (only one presentation per semester). Oral presentations at scientific meetings also count towards this requirement.



Thesis Defense/Final Exam

Degree candidates are required to present a departmental research seminar prior to the Final Exam (*i.e.*, thesis defense). Candidates for the Ph.D. degree must take an oral Final Exam, which is primarily a defense of their dissertation. The Final Exam is scheduled by submitting electronically a completed form “[Request to Admit Candidate to Final Exam](#)” to the Graduate School two weeks in advance of the exam date. The Final Exam is an opportunity for candidates to discuss their research project. The student passes the Final Exam if all or all but one member of the Advisory Committee votes for approval. However, the degree is conferred only after the [Electronic Thesis and Dissertation](#) (ETD) Approval Form has been signed by Advisory Committee members and submitted within two weeks to the Graduate School, and the Graduate School has approved the ETD. See also Graduate School [guidelines for final semester enrollment, degree completion and commencement](#). Students are encouraged to submit the “Application for Degree” on [HokieSPA](#) the semester before they plan to graduate, at which time a “to do” list will be generated to assist in timely completion of all requirements.

Timeline

This table depicts the prescribed timeline for doctoral students who enter with a Bachelor’s Degree to complete the activities noted above.

	<b>Committee Established</b>	<b>Plan of Study Filed</b>	<b>Prelim Exam Taken</b>	<b>Dissertation Defended</b>	<b>Dissertation Submitted</b>	<b>Graduated</b>
<b>Timeline</b>	End of summer after 1 <sup>st</sup> year	End of summer after 1 <sup>st</sup> year	End of spring semester of 2 <sup>nd</sup> year	Within six years	Within six years	Within six years

**IX. CAREER DEVELOPMENT**

Most graduate and post-doctoral trainees do not end up in academic tenure-track positions. It is important that graduate students think about and plan for their post-graduation careers. Fortunately, there is a growing number of resources and opportunities for help with this.

Broadening Experiences in Scientific Training (BEST) Project

Virginia Tech has recently been awarded a BEST grant from the National Institutes of Health to support professional development activities for **doctoral students and postdoctoral trainees in the biomedical sciences**. You may enroll in one or more of the [BEST program activities](#) that are designed to **Broaden the Experiences of Scientific Trainees** in order to:

- provide exposure to multiple diverse career paths in the biomedical sciences
- provide early career guidance and skill development
- better prepare trainees to pursue a variety of career paths

Transformative Graduate Education (Graduate School)

[Transformative Graduate Education](#) is a university-wide initiative developed by Vice President and Dean for Graduate Education Karen DePauw and facilitated by the Graduate School. The implementation of unique programs and opportunities pushes the boundaries of traditional disciplinary academic education and provides

the philosophical underpinnings for a truly innovative graduate education experience. The initiative aims to significantly change how graduate students are prepared to become the next generation of scientists, educators, scholars, engineers, artists, and career professionals in an ever-evolving global context

#### Graduate School Courses

Toward the goal of transforming graduate education at Virginia Tech, the Graduate School has created a series of [graduate courses](#) and experiences designed to better prepare and equip our graduate students with knowledge and skills for meaningful and relevant contributions as citizens in the 21st century.

#### Individual Development Plan (IDP)

The National Institutes of Health recommends that all NIH-funded trainees prepare an Individual Development Plan to explore and set career goals. There is a free [IDP web interface](#) run by the journal Science.

#### Career Services, Division of Student Affairs

Career Services can assist with all aspects of career planning. See [services directed to graduate students](#).

## **X. FACILITIES**

### Keys

Keys are available for the main door, reading room, and for specific laboratories. Keys for Engel Hall are distributed by Zerita Montgomery (Engel main office, room 111) upon payment of a deposit. Keys for Fralin are distributed by Oliver Hirt (Fralin main office). Students needing access to other buildings should consult their Major Professor.

### Reading Room

A Reading Room (Engel 217B) is available for use by graduate students and is accessible with an Engel main door key. The Reading Room contains a refrigerator and microwave, several computers and a printer, and a white board, all for general use.

### Equipment

Students may use any departmental instruments after checking with the appropriate faculty to ensure that the student is knowledgeable in the proper operating techniques and will not interfere with other work in progress. Students should be sure that borrowed items are always signed out, log books are properly maintained, and the instrument and/or lab area are cleaned after use. Students should notify the faculty in charge immediately if equipment malfunctions or breaks during use. Ultimately, Major Professors are responsible for the care of equipment used by their students.

**XI. RESOURCES**

Topic	Individual / Organization
<b>Departmental Assistance</b>	<p>Graduate Committee members:</p> <p><a href="#">Pablo Sobrado</a>, Graduate Program Director</p> <p><a href="#">Zac Mackey</a></p> <p><a href="#">Dan Slade</a></p> <p><a href="#">Bin Xu</a></p> <p><a href="#">Biswarup Mukhopadhyay</a>, Rotation Coordinator</p>
	<p>Graduate Coordinator: <a href="#">Sheila Early</a></p>
<b>Writing Resources</b>	<p><a href="#">Virginia Tech Writing Center</a></p>
<b>Teaching Resources</b>	<p><a href="#">Center for Instructional Development and Educational Research</a></p> <p><a href="#">Graduate Education Development Institute</a></p>
<b>Graduate School</b>	<p><a href="#">Support Resources</a></p> <p><a href="#">Transformative Graduate Education</a></p> <p>“Graduation 101 Series” - a set of YouTube videos:</p> <ul style="list-style-type: none"> <li>• <a href="#">Graduation Guidelines</a></li> <li>• <a href="#">Preparing for Graduation</a></li> <li>• <a href="#">Start of Semester Defense Exception</a></li> <li>• <a href="#">ETD Review</a></li> </ul>
<b>Other Professional Resources</b>	<p><a href="#">Career Services</a></p>
<b>Quality of Life Resources</b>	<p><a href="#">Cook Counseling Center</a></p> <p><a href="#">Graduate Life Center</a></p> <p><a href="#">Schiffert Health Center</a></p>

## XII. INSTITUTIONAL POLICIES

### [Equal Opportunity/Affirmative Action Statement](#)

Virginia Tech does not discriminate against employees, students, or applicants on the basis of age, color, disability, gender, national origin, political affiliation, race, religion, sexual orientation, genetic information, veteran status, or any other basis protected by law. Discrimination or harassment on any of these bases is prohibited by [Policy 1025](#), "Anti-Discrimination and Harassment Prevention Policy."

### [Disability Accommodations](#)

Accommodations are available for students with disabilities. Please notify the Major Professor and/or course Instructor of any accommodations needed. Accommodations are approved through the [Services for Students with Disabilities Office](#).

### [Graduate Honor System](#)

Compliance with the standards of academic conduct expressed in the Graduate Honor Code is expected of all students.

### [Principles of Community](#)

Virginia Tech is a public land-grant university, committed to teaching and learning, research, and outreach to the Commonwealth of Virginia, the nation, and the global community. Learning from the experiences that shape Virginia Tech as an institution, we acknowledge those aspects of our legacy that reflected bias and exclusion. Therefore, we adopt and practice the following principles as fundamental to our on-going efforts to increase access and inclusion and to create a community that nurtures learning and growth for all of its members:

- We affirm the inherent dignity and value of every person and strive to maintain a climate for work and learning based on mutual respect and understanding.
- We affirm the right of each person to express thoughts and opinions freely. We encourage open expression within a climate of civility, sensitivity, and mutual respect.
- We affirm the value of human diversity because it enriches our lives and the University. We acknowledge and respect our differences while affirming our common humanity.
- We reject all forms of prejudice and discrimination, including those based on age, color, disability, gender, national origin, political affiliation, race, religion, sexual orientation, and veteran status. We take individual and collective responsibility for helping to eliminate bias and discrimination and for increasing our own understanding of these issues through education, training, and interaction with others.
- We pledge our collective commitment to these principles in the spirit of the Virginia Tech motto of *Ut Prosim* (That I May Serve).