

Virginia Tech
Chemistry Department

**GRADUATE POLICIES
AND PROCEDURES**

“The Orange Book”

Blacksburg, Virginia

August 2009

Non-Discrimination Statement

Virginia Tech does not discriminate against employees, students, or applicants on the basis of race, color, sex, sexual orientation or identity, disability, age, veteran status, national origin, religion, or political affiliation. The university is subject to Title VI and Title VII of the Civil Rights Act of 1964, Title IX of the Education Amendments of 1972, Sections 503 and 504 of the Rehabilitation Act of 1973, the Age Discrimination in Employment Act, the Vietnam Era Veteran Readjustment Assistance Act of 1974, Federal Executive Order 11246, Governor Allen's State Executive Order Number Two, and all other rules and regulations that are applicable. Anyone having questions concerning any of those regulations should contact the Equal Opportunity/Affirmative Action Office (<http://www.oeo.vt.edu/site/v4/>).

Diversity Statement – The Virginia Tech Principles of Community

- 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).

Key Contacts for Graduate Study in Chemistry

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- Graduate Program Director. Dr. Paul A. Deck, 540-231-3493, pdeck@vt.edu
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Useful Web Sites

- Chemistry Graduate Program. <http://www.chem.vt.edu/grad/index.html>
- Graduate School Policies. http://www.grads.vt.edu/graduate_catalog/poli/UIPo.jsp
- Graduate School Forms. <http://www.grads.vt.edu/forms>
- Expectations for Graduate Study: <http://www.grads.vt.edu/academics/expectations/index.html>
- Graduate Student Assembly. <http://www.gsa.uusa.vt.edu/>
- Cranwell International Center: <http://www.uusa.vt.edu/cranwell>

The Orange Book – Table of Contents		page
Section 1. General Policies and Procedures for Chemistry Graduate Programs		4
Section 2. The Master of Science Degree		10
Section 3. The Doctor of Philosophy Degree – General Structure and Policies		11
	General Course Requirements	11
	Timeline and Checklist	12
Section 4. The Doctor of Philosophy Degree – Detailed Policies and Procedures		13
	Foundation Courses	13
	Major (Specialty Area) Courses	14
	Literature Review and Research Plan (CHEM 5914)	15
	Preliminary Oral Examination (Doctoral Candidacy Exam)	15
	Original Research Proposal (CHEM 6904 and CHEM 6914)	15
	Seminars	16
Section 5. Graduate Student Financial Support		17
Section 6. Chemistry Faculty Directory		18

IMPORTANT NOTICE

The Policies and Procedures outlined in this Orange Book are supplemental – and entirely subordinate – to the general [Virginia Tech Graduate School Policies and Procedures](#). All students are responsible to be aware of both Chemistry Department *and* Graduate School policies pertaining to their degree programs and individual situations. International students are responsible for awareness of immigration policies and procedures at Virginia Tech.

Remember: This is *your* education, *your* graduate program, *your* degree, and *your* career.

1. General Policies & Procedures for Graduate Programs (M.S. and Ph.D.)

- A. Admission. Complete admission policies and procedures may be found at the [Graduate School web site](#) and the [Chemistry Department Graduate Program web site](#). The Chemistry Department evaluates applicants to its graduate programs on the following criteria.
- Prior academic performance as reflected in university transcripts: The courses completed, the grades earned, and the institution(s) where prior degree(s) were received.
 - Preparation as measured by GRE scores. The General GRE Exam is required, while the Chemistry Subject GRE exam is only recommended.
 - Mastery of the English language as measured by TOEFL scores (international students).
 - Promise for acclimation to graduate study as reflected in letters of recommendation.
 - Likelihood that the student's interests and motivations are well matched to our graduate program, as measured by questions on the Graduate School application for admission.
- B. Orientation Week. All entering students are expected to attend Orientation Week, which is normally the week before classes begin in the Fall Semester, and to participate in all of the activities according to a [schedule](#) that is provided in advance.
- The Graduate Program Director will present an introduction to Chemistry Department policies, procedures, and practices, as well as normal graduate student activities.
 - Students will meet with departmental financial officers to file immigration documents, confirm assistantship status, arrange payroll, and discuss insurance and liability matters.
 - All students who wish to be eligible for a Graduate Teaching Assistantship *at any time during their graduate program* must attend the Graduate School's [GTA Workshop](#). The Graduate Coordinator will automatically enroll all entering students in the GTA Workshop (GRAD 5004) unless notified to do otherwise.
 - All PhD students must take the four Chemistry Proficiency Exams. These are standardized ACS exams in instrumental analysis (analytical), organic, inorganic, and physical chemistry. A passing (> 60th US national percentile) score on any proficiency exam fulfills the Foundation requirement in that area. A poor (< 20th percentile) or marginal (20th – 60th percentile) performance on any given exam will invoke an additional course requirement.
 - Students will meet with the Graduate Program Director to learn their Proficiency Exam results, announce their selection of a Major subject area (analytical, inorganic, organic, physical, or organic-polymer), and arrange their initial course schedule.
 - Students on assistantship support will attend an initial GTA Meeting with General Chemistry and Organic Chemistry lab instructors.
 - **International students** will (a) attend the Cranwell Center's orientation session, (b) Take a "Teach Test" to determine if ENGL 0014 is needed, and (c) take an English Placement Test (EPT) organized by the Language and Culture Institute to determine if they need the Academic & Professional Writing (APW) course (<http://www.lci.vt.edu/elp/>).
- C. Orientation to Graduate Research. All entering students are required to pass CHEM 5004 (Orientation to Graduate Research) during their first *fall* semester in residence in order to remain in the graduate program. This course will include the following topics.

- Laboratory safety, chemical hygiene, hazardous waste handling, MSDSs, and first aid.
- Library resources, techniques for locating and organizing scientific reference materials, and educational technologies/resources such as Blackboard and Scholar.
- Ethics and integrity in academic life and research, including the [Graduate Honor System](#).
- Organization of the Department and the university.
- Resources for students with [physical/mental health issues](#) or [disabilities](#).
- Expectations for Graduate Study at Virginia Tech. ([link to document](#))
- Current research activities in the Department (typically three evening symposia).
- Achieving an appropriate work-life balance as a graduate student.

D. Choosing a Research Director. The Research Director is the faculty member with whom the student will work most closely. Other terms for Research Director include “Major Professor,” “Faculty Adviser,” and “Committee Chair.” Usually each student will have one Research Director, although an arrangement with two Research co-Directors is also possible.

During the first semester, an entering student must interview a minimum of four (4) faculty members in addition to attending the research symposia organized through CHEM 5004. A [Faculty Interview Signature Form](#) is used to document these interviews. Interviews help students select a Research Director *and* meet professors who might serve on their Advisory Committees. Therefore, *four interviews must be completed even though a student may have already identified a research director*. The Department does *not* (but some professors do) require the student to be in the same interest area as the Research Director.

A second [Research Director Request Form](#) requires the student to list, in ranked order, the names of three (3) professors whom he or she is nominating as his or her Research Director. There is space on the form to provide a brief narrative explaining the choices.

- Deadline. The fully executed Faculty Interview Signature Form and the Research Director Request Form must be submitted to the Graduate Coordinator on or before November 1st in the year of entry to the program.

The final assignment of the thesis advisor will be made by the Department Chairperson, and will be based on several factors including the student’s ranked nominations (and the narrative explanations thereof), the equitable distribution of students among research groups, the needs and preferences of the professors, and the projected ability of individual professors to provide assistantship support to their students, especially in the latter portions of their programs. Usually, the assignments are made by December 15th. Until a Research Director is assigned, the Graduate Program Director will serve as the formal advisor to each entering student.

E. Advisory Committee. Each student, with the concurrence of the Research Director, shall recommend to the Dean of the Graduate School the appointment of an Advisory Committee. This committee consists of the Research Director, as chair, and at least two other members for an M.S. and at least four other members for a Ph.D. committee. Guidelines for the composition of the Advisory Committee are provided on the [Graduate Program Forms page](#).

- Deadline. The student’s recommendation for Advisory Committee members shall be submitted to the Graduate Coordinator on or before April 1st of the student’s first year. The required form is part of the Plan of Study Setup form (see next section).

- F. Plan of Study. Each student shall prepare a Plan of Study (POS) for his or her graduate degree, using the departmental [Plan of Study Setup Form](#). The POS lists the courses that the student and the Advisory Committee agree will provide a background consistent with University and Departmental requirements, the student's research objectives, and the student's career plans. This Plan shall be signed by the student, the Advisory Committee, the Graduate Program Director, and the Department Chairperson (in that order). The completed form is given to the Graduate Coordinator, who will submit the POS and Advisory Committee to the Graduate School for approval.

All changes to the Plan of Study require a Graduate School [Plan of Study Change Form](#) to be fully executed and submitted to the Graduate Coordinator. For Ph.D. programs, all revisions should be approved by the Advisory Committee prior to the Annual Evaluation Meeting in the student's fourth academic year.

The following policies also apply to Chemistry Plans of Study (MS and PhD).

- Courses numbered *lower* than 4000 may not be applied to a Plan of Study except as Supporting Courses. They do not count toward credit hour requirements.
- No more than six (6) credits of 4000-level courses may be applied to a Plan of Study. Others may be listed as Supporting Courses but do not count toward credit requirements.
- Audited courses, or courses taken as Pass-Fail for which a graded option was available, may not be used. (Grade options may *not* be changed after a course is completed.)
- Orientation courses (GRAD 5004, CHEM 5004) may be used on a Plan of Study, however they may not be counted toward the 12 course credits required for the PhD.

- G. Transfers, Waivers, and Substitutions. Students entering with prior experience in another graduate degree program (including those already holding an M.S. degree) are bound by the same degree requirements as all other entering students. However, a student with prior graduate course work of acceptable quality at an accredited US or Canadian university may petition the Graduate Program Director to waive specific departmental (but not university) degree requirements. Departmental waivers do *not* require the transfer of course credit. However, high standards are applied in the evaluation, and waivers are relatively rare.

Graduate students transferring from other universities or students with prior MS degrees often inquire about transferring course credit. In practice, credit transfers are helpful only in the most extraordinary cases, simply because Virginia Tech's credit requirements for the PhD in Chemistry are relatively low and is reached quickly in meeting departmental requirements. The following regulations will apply to transferring credits from other universities.

- The credits must have been earned as part of a *graduate* degree program (MS or PhD) at an *accredited* university within the United States or Canada.
- Research credits (thesis or dissertation) do not transfer.
- Courses transferred must be full-graduate courses, not BS/MS level courses.
- The student must have earned a "B" or higher in any course that is transferred, and there must be a Virginia Tech *graduate* course that corresponds to each course transferred.
- Transfer credits may not exceed Virginia Tech credits on a Plan of Study.

- One credit on a quarter-system typically transfers as 2/3 of a credit at Virginia Tech.
- H. Good Standing. For a graduate student to remain in “Good Standing” requires maintaining a GPA (QCA) of at least 3.0 overall, and at least 3.0 on the courses listed on his or her Plan of Study. A student who fails to meet this standard will be placed on Academic Probation and will have one probationary semester in which to bring his/her grades back up above 3.0. Otherwise the student risks dismissal from the program. There are also consequences for financial support as explained in Section 5C. In addition, a student is expected to make “satisfactory degree progress” (encompassing research productivity, intellectual growth, and other subjective criteria) in the opinion of the Advisory Committee (or the Graduate Program Director if a committee has not yet been appointed for the student).
- I. Repeating Courses. If a student obtains a grade below C– for a course on the Plan of Study, the course **must** be retaken. After the second (passing) enrollment, the first grade is changed to a Repeat Graduate (RG) grade that does not influence the QCA; the new grade (even if lower) is used. The Graduate School may consider requests to repeat courses with grades of C–, C or C+, but those requests are typically denied. Note that the RG option can be used for pass-fail courses but *not* for Research Courses (e.g., CHEM 5904, CHEM 7994).
- J. Dropping Courses. A student may drop a course without penalty or transcript mark through the 30th course day (end of the sixth week) of a semester (October 2 for the Fall 2009 term; March 1 for the Spring 2010 term). The Department requires you to notify the course instructor and your Research Director when you drop a course.

After the “last day to drop,” a student may still withdraw from a course up through the end of the 14th week of classes (December 4 for the Fall 2009 term; April 30 for the Spring 2010 term). Requests must be made using a [Graduate School form](#). The transcript will be marked “WG” (withdraw-graduate) for the course. WG does not influence the student’s GPA.

Students on assistantship support (GTA or GRA) must be enrolled for 12 credit hours during the Spring and Fall semesters. Therefore, if dropping or withdrawing from a course results in a schedule with fewer than 12 credit hours, ask the Graduate Coordinator to late-add the necessary research credits (CHEM 5994 or CHEM 7994) to your schedule. You will not be able to add the credits yourself past the end of the first week of classes.

- K. Annual Evaluations. Every academic year, each student must participate in the department’s Annual Evaluation System, a formal mechanism by which Advisory Committees and the Graduate Education Committee provide constructive feedback to student on their degree progress and academic standing. Evaluation forms and instructions are provided on the [Graduate Program forms page](#). The student prepares a Self Evaluation Form, a Student Activities Report, and a Research Update (each is one page), and submits them to the Graduate Coordinator for electronic distribution to the student’s Advisory Committee. The Advisory Committee reads the student’s documents and then holds an Evaluation Meeting to discuss the student’s progress and provide comments on a Student Evaluation Form (which is the same form that the student uses for the Self Evaluation). This form is submitted to the Graduate Education Committee, which reviews all of the forms and selects a performance rating for the student and provides the student with constructive feedback on his or her degree progress. Ideally, the Evaluation Meeting is coupled to one of the “milestone” events in the student’s program, such as an oral exam or a seminar.

- J. Thesis or Dissertation. As the student nears completion of his or her research projects, he or she will prepare a thesis (MS – thesis option) or a dissertation (PhD) that describes the background to their research, the methods used, the data gathered, and the overall findings. The student should prepare a *preliminary draft* for formal review by the entire Advisory Committee, preferably at least *six weeks* before the anticipated defense date. The preliminary draft must be complete and in its final form; all tables, graphs, etc. must be included. Tables of Contents, figures, schemes, etc., are to be properly formatted. There are *many* Graduate School policies and procedures dealing with the preparation and submission of a thesis. See the Virginia Tech Graduate School web site for details.

While a dissertation should demonstrate coherence and unity in its subject matter, under certain conditions, manuscripts for publication and/or published papers may be used as dissertation chapters. Each “manuscript chapter” requires a preamble that explains the role of the student in the research (if the manuscript has more than one author besides the student and his or her Research Director), and the relationship of the manuscript to the overall subject matter of the dissertation. A dissertation comprising manuscript chapters also requires an introductory (background) chapter and a concluding chapter summarizing overall findings.

- K. Final Oral Examination. All students (thesis MS, non-thesis MS, and PhD) must have a Final Oral Examination at the conclusion of their degree programs. When the Advisory Committee confirms (by signature) that the preliminary draft of the thesis or dissertation is “ready for defense,” they shall recommend to the Dean of the Graduate School that the student schedule a final examination, which will be mainly on the subject area of the student’s research. This recommendation must be filed with the Graduate School (via the Graduate Coordinator) at least two (2) weeks prior to the date requested for the defense, using the Graduate School’s [“Request to Admit Candidate to Final Exam”](#) form. The Graduate Program Director will sign forms within the two-week window only under the most extenuating circumstances. Several regulations apply to the scheduling and execution of final examinations; the student is strongly advised to consult the Policies and Procedures section of the [Graduate School web pages](#) for details.
- L. Defending Student Status. DSS may be used when a student has already completed the thesis or dissertation (and submitted it to the Advisory Committee) but needs to be enrolled for the purpose of defending. The Graduate School charges a fixed fee (approximately \$700, paid by the student), the student is automatically registered for one credit hour. While the student may have his or her Final Examination any time during the term that DSS is used (subject to normal Graduate School deadlines), the [DSS form](#) and the fully executed [“Request to Admit Candidate to Final Exam”](#) form must be submitted by Friday of the third week of classes. Because the latter form requires the Advisory Committee to certify the suitability of the thesis or dissertation for defense, the Chemistry Department will not endorse the use of DSS for a given term unless the thesis or dissertation has been turned in to the Advisory Committee prior to the first day of classes. (There is somewhat more flexibility in DSS deadlines during the Summer Sessions.) The alternative to DSS, if one is not supported on an assistantship, is to register for three research credits (CHEM 5994 or CHEM 7994), for which tuition is paid by the student. Students who think they might use DSS should also consider [determining their eligibility for in-state tuition rates](#) at least three months in advance.

2. Master of Science (MS) Degree

A. Thesis Option. The following requirements apply to the M.S. degree with the thesis option.

- Completion of 20 course credit hours. CHEM 5894 (Final Examination) may not be used on a Plan of Study.
- Completion of at least 10 credits of Research and Thesis (CHEM 5994). Credits earned for Research and Dissertation (CHEM 7994) may be applied to this requirement.
- Each student must present a formal seminar on his or her research, ordinarily in the same semester as the defense. The one credit of CHEM 5944 Graduate Seminar thus earned may be counted toward the 20 credits needed at the 5000 level or higher.
- Each student must prepare and orally defend a Thesis before the candidate's Examining Committee. Students should read the relevant Graduate School policies on examinations.

B. Non-Thesis Option. The non-thesis M.S. program is intended for students who are not able to undertake a research M.S. degree (*e.g.*, part-time students or secondary school teachers). A student in a thesis M.S. or Ph.D. program may switch to the non-thesis M.S. degree option using the [Change of Degree Status](#) form available on the Graduate School's web pages.

Students in other departments may seek the non-thesis M.S. degree in Chemistry while continuing in their regular programs. Such students must meet all requirements expected of chemistry students, including (a) approval of a Plan of Study, (b) assignment of a Chemistry faculty member to the Advisory Committee as chair or co-chair, (c) passing a formal Final Examination, the content of which is determined by the MS Advisory Committee.

The following requirements apply to the M.S. degree with the non-thesis option.

- Completion of at least 24 course credit hours at the 5000 level or higher. One of these courses must be CHEM 5914 Literature Review. CHEM 5944 Graduate Seminar (one credit) may be used on the non-thesis MS Plan of Study but is not required. Orientation courses (GRAD 5004, CHEM 5004) may also be used.
- Completion of an additional 6 course hours (either 4000 or 5000 level courses). At the Advisory Committee's discretion, 3 credits of these additional 6 credits may be applied to CHEM 5904 Project and Report. This option is normally used by students who have changed from the PhD program to the MS program and would benefit from preparing a report on the research progress they made while in the PhD program.
- In the last semester of a non-thesis MS program, the student must schedule a Final Examination through the Graduate School.

C. Transferring from M.S. to Ph.D. A student on an M.S. plan of study may, pending approval of the Advisory Committee, transfer to the Ph.D. program prior to the completion of their third academic year in residence, using a [Change of Degree Status form](#). Such students are subject to the same progress deadlines as if they were in the Ph.D. program continuously. Students who have completed and successfully defended an M.S. thesis are generally granted a one-year adjustment to their progress deadlines, although the 5-year assistantship support limit remains unchanged). (See section 4H for transfers from the Ph.D. to the M.S.)

3. Doctor of Philosophy (PhD) Degree –Structure and Policy Summary

- A. Graduate School Course Requirements. In addition to the general policies for the Plan of Study (Section 1F), a doctoral Plan of Study must meet the following requirements.
- The student must earn a total of 90 credits. Students typically register for 12 credits per semester, and no credits during the summer. Thus the total credit requirement is easily met in 8 semesters, whereas students rarely are prepared to defend before then.
 - The student must have at least 30 credits of Research and Dissertation (CHEM 7994).
 - The student must earn 12 credits in lecture courses numbered 5000 or higher. Note that the Commission on Graduate Studies and Policies has granted the Chemistry Department a waiver from the 27 credit hour requirement stated in the Graduate School Policies.
- B. Chemistry Department Course Requirements. The Chemistry Department has established course requirements (Table 1) that augment and supplement the basic requirements established by the Graduate School.

Table 1. Chemistry Department **Minimum** Course Requirements for the PhD

	Credits
Courses at 5000 level or higher	12
Orientation to Graduate Research (CHEM 5004) ^b	1
Graduate Seminar (CHEM 5944, enrollment in 2 separate semesters)	2
Literature Review and Research Plan (CHEM 5914)	3
Generating Research Ideas (CHEM 6904 or CHEM 6984)	1
Original Research Proposal (CHEM 6914)	3
Research and Dissertation (CHEM 7994)	Balance
Total	90

- Depending on the student's performance on the Proficiency Exams given during orientation week, additional "Foundation" courses may be required (Section 4A).
- Specific "Major" courses (combinations of 5000 and 6000 level courses) for students in each of the different research areas within chemistry are spelled out in Section 4B.
- Additional "elective" courses may be placed on the Plan of Study to ensure that the student has a background consistent with research plans and career objectives.
- Students entering after January 1, 2009 must pass an orientation course (CHEM 5004).
- Students must prepare a comprehensive Literature Review and Research Plan in their third semester of residence (CHEM 5914, 3 credits). See Section 4C for details.
- Students must take their Preliminary Oral Examination in the fourth semester of residence. Regulations for this exam are found in Section 4D. The Prelim Oral is the Graduate School's formal "examination of record" for doctoral candidacy.

- Students entering after January 1, 2007 must pass a course on Generating Research Ideas in their fifth semester of residence (CHEM 6904 or equivalent). See Section 4E.
- Students must prepare a written Original Research Proposal in their sixth semester of residence (CHEM 6914, 3 credits). The proposal is defended orally before the Advisory Committee. See Section 4E.
- Ph.D. candidates are required to attend all Highlands in Chemistry seminars. Attendance at additional seminars may be required by a student's Research Director. See Section 4F.
- Ph.D. candidates present two seminars. See Section 4F. The first may either be based upon the student's research (if presented externally at a professional meeting), or on a general literature topic unrelated to the student's research area (if presented internally). The second seminar, on the topic of the student's research, must be presented internally, generally at least 6 months prior to the student's final examination.
- Students may be subject to additional formal reviews and examinations, which usually involve a written progress report and a meeting with the advisory committee. Section 4G.
- Students must prepare and successfully defend before their committee, a dissertation describing their research. See Section 1K.

C. PhD Program Timeline and Checklist.

Note: Students who begin graduate study in the spring semester will typically be considered "second year" students in their first fall semester. However CHEM 5004 and GRAD 5004 are only available in the Fall term, so these must also be taken in the student's first fall semester.

Year One

- Orientation Week and CHEM 5004. GTAs will also need to take GRAD 5004, and some international students will need to take ENGL 0014 and/or the APW course.
- Make progress on Foundation, Major, and Elective courses.
- Nomination of the Research Director (Fall term).
- Appointment of the Advisory Committee (2nd semester of residence).
- Submission of the Plan of Study (2nd semester of residence).

Year Two

- Complete Foundation, Major, and Elective courses (if not yet completed).
- Literature Review and Research Plan (CHEM 5914, 3 credits, Fall term).
- Preliminary Oral Examination (Spring term).

Year Three

- Generating Research Ideas (CHEM 6904 or CHEM 6984, 1 credit, Fall term).
- Original Research Proposal (CHEM 6914, 3 credits, Spring term, includes Oral Defense).
- General or External Seminar (CHEM 5944, 1 credit).

Fourth Year and Beyond

- Research seminar (CHEM 5944, 1 credit, end of fourth year or beginning of fifth year).
- Preparation and submission of dissertation.
- Final (Oral) examination and defense of the dissertation.

Every Year

- "Highlands in Chemistry" seminars.
- Participate in the Annual Evaluation System.

4. Doctor of Philosophy (PhD) Degree – Detailed Policies and Procedures

- A. Foundation Courses. Each student needs a foundation of basic knowledge on which to build a specialized degree program. Students must demonstrate “proficiency” in each of the four areas of chemistry (analytical, inorganic, organic, and physical). Proficiency is demonstrated by examination (a 60th percentile or higher score on the corresponding ACS Exam administered during orientation week) **or** by passing specific course(s), as shown in Table 2.

Table 2. Courses Meeting the Chemistry Foundation Requirements.

	Examination Score	Approved Foundation Courses
Analytical Chemistry	< 20 th percentile	CHEM 4114 (Instrumental Analysis)
	20 th to 60 th percentile	CHEM 5104 (Separations) or CHEM 5114 (Electrochemistry) or CHEM 5124 (Spectroscopy) or CHEM 6164 (Current Topics). ^(b)
Inorganic Chemistry	< 20 th percentile	CHEM 2424 (Descriptive Inorganic Chemistry)
	20 th to 60 th percentile	CHEM 5404 (Advanced Inorganic Chemistry)
Organic Chemistry	< 20 th percentile	CHEM 2565 and 2566 (Principles of Organic Chemistry, 1-yr sequence)
	20 th to 60 th percentile	CHEM 4534 (Organic Chemistry of Polymers) or CHEM 5524 (Molecular Structure Determination) or CHEM 5505 (Advanced Organic Chemistry I)
Physical Chemistry	< 20 th percentile	CHEM 3615 (Undergrad thermo) or CHEM 3616 (Undergrad quantum)
	20 th to 60 th percentile	CHEM 5644 (Colloids & Surfaces), CHEM 5664 (Kinetics), CHEM 6624 (Thermodynamics), CHEM 6634 (Quantum Mechanics), CHEM 6654 (Statistical Mechanics), or CHEM 6674 (Polymer Physical Chemistry).

Foundation courses may not be taken Pass/Fail. Courses listed for exam scores below the 20th percentile are *recommended*. Students scoring below the 20th percentile in a given area may, with Graduate Program Director approval, choose a course intended for students scoring in the 20th-60th percentile range instead. Students must consult the Graduate Program Director to see if particular implementations of CHEM 6x64 (Special Topics) or CHEM 5984/6894 (Special Study) have been approved as meeting a particular Foundation Requirement.

Sometimes, a student will perform poorly on two, three, or even all four of the Proficiency exams. Serious deficiencies can preclude direct, uninterrupted pursuit of the Ph.D. degree. Occasionally, students with serious deficiencies are required by the Graduate Committee to complete an M.S. degree before they can be considered further for possible Ph.D. candidacy. However it is typical (average over several years) for students to need two Foundation Courses.

Students may request that Foundation Course requirements be waived on the basis of prior graduate course work of acceptable quality completed at an accredited US or Canadian university. Standards for evaluating waiver requests are high, and waivers are relatively rare.

B. Major Courses. Table 3 shows the required courses for the five sub-disciplinary majors, and the semester (F or S) in which it is typically offered. Some courses are typically offered only in even (E) or odd (O) years. Students should plan their schedules accordingly and be aware that course scheduling is subject to change. Besides the major courses, students also may need to take additional Foundation Courses (Section 4A). Students should also consult their Research Directors and the Advisory Committees regarding additional elective courses that may be recommended as part of their Plan of Study.

Table 3. Required Courses for Chemistry Sub-Disciplinary Majors

	Course	E/O	F/S	Cr
Analytical Chemistry				
<i>Required</i>	CHEM 5104: Advanced Analytical Chemistry I		F	3
	CHEM 5134: Instrument Design		S	3
	CHEM 5124: Analytical Spectroscopy	O	S	3
<i>Strongly recommended</i>	CHEM 6164: Current Topics in Analytical Chemistry	E	S	3
Inorganic Chemistry				
<i>Required</i>	CHEM 5404: Advanced Inorganic Chemistry		F	3
	CHEM 6464: Current Topics in Inorganic Chemistry (Physical Methods)		S	3
<i>Choose One</i>	CHEM 6434: Organometallic Chemistry	O	S	3
	CHEM 6664: Current Topics in Physical Chemistry (Group Theory)	E	S	3
Organic Chemistry				
<i>Required</i>	CHEM 5505: Advanced Organic Chemistry I		F	3
	CHEM 5506: Advanced Organic Chemistry II		S	3
	CHEM 5524: Molecular Structure Determination		F	4
	CHEM 5535: Synthetic Organic Chemistry I		S	3
Organic Polymer				
<i>Required</i>	CHEM 5505: Advanced Organic Chemistry I		F	3
	CHEM 5704: Synthesis and Reactions of Macromolecules		F	3
	CHEM 6564: Advanced Macromolecular Chemistry		S	3
Physical Chemistry				
<i>Choose THREE</i>	CHEM 6624: Chemical (Statistical) Thermodynamics		F	3
	CHEM 6634: Quantum Mechanics		F	3
	CHEM 5664: Chemical Kinetics	O	S	3
	CHEM 6674: Physical Chemistry of Polymers	E	S	4
	CHEM 5644: Colloid and Surface Chemistry	O	S	3
	CHEM 5124: Analytical Spectroscopy ^a	O	S	3

^a CHEM 5124 cannot count for *both* a Physical Major Course *and* an Analytical Foundation Course.

C. Literature Review and Research Plan. CHEM 5914 is an independent study/seminar course, with several meetings throughout the semester to provide forums for discussion. The student writes a literature review in the area of the thesis topic for evaluation by a subset (“readers”) of his or her Advisory Committee. This review (with updates) can provide the core of the first dissertation chapter. The last several pages of the document should also outline plans for the next 3 years of research. Details and deadlines are contained with the [CHEM 5914 course syllabus](#) (see graduate program web site).

D. Preliminary Oral Examination. All doctoral students must pass a preliminary examination administered by an Examining Committee in accordance with [Graduate School policies](#). The Preliminary Exam may be oral, written, or both, but current Chemistry Department practice is to administer an oral exam. The Exam is held in the Spring semester of the second year.

The Preliminary Exam allows the Advisory Committee to estimate whether the student is likely to be awarded a Ph.D. degree at the completion of about 5 years of study. The student will be judged on: (1) knowledge of chemistry, (2) logical/critical thinking, (3) awareness of the literature, (4) independence and originality, and (5) research productivity. The following eligibility requirements apply.

- Students in the Organic and Organic Polymer areas must have *fully completed* all of their required “major” courses listed in Table 3 in Section 4B.
- Students in the Analytical, Inorganic, and Physical majors must have completed all of their required “major” courses listed in Table 3 in Section 4B except for a maximum of one course that must either be (a) in progress or (b) delayed because it was not offered that year.
- All students must have completed their “Foundation” courses, except for a maximum of one course that was either (a) in progress or (b) delayed because it was not offered that year.
- All students must have passed CHEM 5914 (Literature Review and Research Plan). While the Literature Review serves as the *basis* for the exam, it is not formally considered the “written” part of the Prelim.

Detailed [Prelim Exam Guidelines](#) are posted on the Graduate Program Forms web page.

E. Original Research Proposal. Skills in writing research proposals are vital for meaningful research, and for obtaining funding. This course will provide experience in the preparation of a scientific proposal. In a two-semester course sequence, students will prepare a written proposal for evaluation by committee members.

- CHEM 6904 Generating Research Ideas (1 credit) is enrolled in the Fall of the third year. This seminar course helps the student find ideas and evaluate their suitability for development into proposals. The [CHEM 6904 course syllabus](#) is posted on the graduate program web site.
- CHEM 6914 Original Research Proposal is an independent study course with several discussion meetings throughout the semester. The student writes a research proposal in an area **not** currently under investigation in his or her own research group. The course *includes* an oral exam in which the student defends the proposal and summarizes his or her research progress before his or her Advisory Committee. This oral exam is *not* formally scheduled through the Graduate School. Details and deadlines may be found in the [CHEM 6914 course syllabus](#) and the [ORP Oral Exam Guidelines](#) posted on the Graduate Program Forms web site.

- F. Seminars. Ph.D. students are required to attend the weekly Highlands in Chemistry Seminars for all semesters in which they are enrolled for three (3) credit hours or more. Students may miss *no more than two* Highlands Seminars in any given semester. In addition students must attend 80% of the Graduate Seminars in any semester in which they are enrolled in CHEM 5944 Graduate Seminar.

Students in the Ph.D. program are required to pass CHEM 5944 in two *different* semesters (total of 2 credits). The requirement for the first “external” seminar may be met three ways:

- Documented oral presentation of a paper at a professional meeting. The presentation must be an *oral paper* (e.g., no poster sessions), given *outside* normal departmental functions (e.g., no group meetings), with an audience. The meeting should ideally be a national or regional ACS Meeting or comparable organization. Meetings on the VT campus such as those organized by MII, GSA, or ICTAS meet the requirement minimally. Documentation of the student’s participation in the meeting is required. The student should also register for CHEM 5944 in the same semester that the presentation occurs, or the subsequent semester.
- Presentation of a full (e.g., 40 minute) departmental seminar at an accredited college or university within the United States or Canada. Ordinarily the institution will be the student’s *alma mater* and the student will also serve to conduct graduate recruitment there.
- Presentation of a seminar on a general topic unrelated to the student’s research (i.e., literature seminar), scheduled in CHEM 5944. In current practice this option is rarely used.

The second “internal” seminar requirement is met by presenting a seminar on the dissertation research and enrolling in CHEM 5944 in the semester in which the seminar is to be presented. Scheduling the research seminar requires the consent of the student’s Advisory Committee, so that at least three members can be present. Ordinarily the second seminar serves as the basis for the fourth formal annual review of the student but may be delayed until the fifth year. Note that an internal seminar completed as part of a Thesis M.S. degree may not be substituted for the doctoral internal seminar requirement.

Additional policies pertaining to Graduate Seminar may be found in the [CHEM 5944 Graduate Seminar course syllabus](#), posted on the Graduate Program Forms website.

- G. Additional Formal Reviews. A graduate student, or any member of his or her Advisory Committee, may request a meeting at any time to discuss progress in the degree program and future plans. With the Annual Evaluation System now in place, however, additional requests for progress meetings are expected to be rare.
- H. Transferring from the Ph.D. to the M.S. Students who wish to transfer from the Ph.D. program to the M.S. program (or students who are directed by their Advisory Committees to do so) should use the [Change of Degree Status form](#). Once a student has submitted this form, they are generally expected to complete and defend the M.S. thesis by the end of the subsequent academic semester. For information on transferring from the M.S. to the Ph.D. program, please see Section 2C.

5. Graduate Student Support

- A. The Purpose of Assistantships. The Assistantship Agreement is a contract providing the student with a stipend (a form of financial aid) suitable to maintain an acceptable standard of living in exchange for the performance of specific duties. However, the main objective of the assistantship is to enable the student to focus all of his or her professional energies on the activities of full-time graduate study. For this reason, students supported on assistantships are forbidden from seeking or engaging in other paid employment (including private tutoring) without the written consent of their Research Directors.

Teaching Assistants (GTAs) carry out instructional tasks including lab teaching, grading, exam proctoring, and assisting technical staff with the maintenance and operation of instructional instrumentation. Research Assistants (GRAs) perform research tasks that are usually (but not necessarily) applicable to the student's dissertation or thesis research. The Assistantship Agreement allows for department to task the student with a maximum of 20 hours (*on average*) per week for the duration of the assistantship period.

Requests to change from GTA to GRA during a semester will be considered only if a suitable GTA replacement is available (this happens very rarely). While assistantship contracts are generally established for full academic years, students may be switched from GTA to GRA (and *vice versa*) between Fall and Spring terms to accommodate changes in research funding.

Please contact the Graduate Program Director for information on fellowships and other non-assistantship forms of financial support.

- B. Tuition Scholarships. It is University policy that all students holding an assistantship be awarded a tuition scholarship. Normally the tuition payment is credited directly to the student's account. It must be understood that tuition is not "waived." Instead, the department uses its funds to pay the required tuition. Thus, a student not supported on assistantship is responsible for his or her own tuition.
- C. Eligibility. Subject to university regulations, the Department guarantees assistantship support for all graduate students on PhD Plans of Study through the end of the fifth academic year in residence. To maintain eligibility, the student must remain in "good standing" (GPA of 3.0 or better with satisfactory performance in both teaching and research). Students with lower GPAs may receive assistantships if the Director of Graduate Studies asks the Graduate School for an exception. Good Standing also requires that the student be making adequate degree progress in the opinion of his or her Advisory Committee. A student who has received two consecutive "Unsatisfactory" evaluations through the Annual Evaluation System is ineligible for assistantship support. Students who switch from the Ph.D. program to the M.S. program are generally allowed one additional full semester of assistantship support to complete and defend the thesis.
- D. Time Off. Vacation time does *not* accrue to an assistantship as a fringe benefit. The Agreement indicates that the assistantship period *includes* the normal breaks between terms. Thus during these breaks the student is expected to be present and engaged in the activities of graduate study. Planned absences require prior approval from the supervisor (the Research Director or Graduate Program Director, using the [Planned Absence Approval Form](#)).

6. Faculty Directory

Professors Accepting Students into Research Groups in 2009			
Professor	Office	Phone	Email Address
Karen J. Brewer	Hahn 1105	231-6579	kbrewer@vt.edu
Paul R. Carlier	Hahn 3103	231-9219	pcarlier@vt.edu
T. Daniel Crawford	Hahn 1110	231-7760	crawdad@vt.edu
Paul A. Deck	Hahn 2101	231-3493	pdeck@vt.edu
Harry C. Dorn	Hahn 1109	231-5953	hdorn@vt.edu
Alan R. Esker	Hahn 1107	231-4601	aesker@vt.edu
Felicia A. Etzkorn	Hahn 3105	231-2235	fetz Korn@vt.edu
Richard D. Gandour	Davidson 302	231-3731	gandour@vt.edu
Harry W. Gibson	Hahn 2105	231-5902	hwgibson@vt.edu
Brian E. Hanson	Davidson 105	231-7206	hanson@vt.edu
David G. I. Kingston	Hahn 3111	231-6570	dkingston@vt.edu
Gary L. Long	Davidson 230	231-7575	long@vt.edu
Timothy E. Long	Hahn 2108	231-2480	telong@vt.edu
Louis A. Madsen	Davidson 405	231-1270	lmadsen@vt.edu
Hervé Marand	Davidson 301E	231-8227	hmarand@vt.edu
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Robert B. Moore	Hahn 1103	231-0641	rbmoore3@vt.edu
John R. Morris	Hahn 1101	231-2472	jrmorris@vt.edu
Theresa M. Reineke	Hahn 2105	231-7011	treineke@vt.edu
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Webster L. Santos	Davidson 401B	231-5742	santosw@vt.edu
James M. Tanko	Hahn 3109	231-6687	jtanko@vt.edu
Brian M. Tissue	Davidson 406	231-3786	tissue@vt.edu
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Edward F. Valeev	Davidson 403	231-8218	evaleev@vt.edu
Sungsool Wi	Hahn 3107	231-3494	sungsool@vt.edu
Gordon T. Yee	Hahn 2103	231-3090	gyee@vt.edu