VirginiaTech
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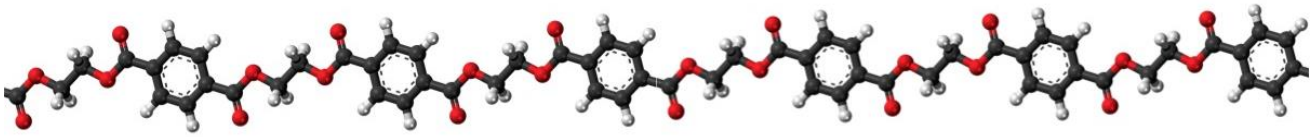
# Macromolecular Science and Engineering



Graduate Policies and Procedures
M.S. and Ph.D. Programs

AY 2024 - 2025

**Macromolecular Science and Engineering (MACR)**
1075 Life Science Circle, Suite 110 (MC 0201)
Blacksburg, VA 24061

# TABLE OF CONTENTS

## NONDESCRIMINATION 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 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.hr.vt.edu/).

## 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).

## IMPORTANT CONTACTS

Director, MACR Graduate Degree Program
Prof. Michael J. Bortner, (540) 231-4213, mbortner@vt.edu
Graduate Degree Program Administrator
Kim Felix, (540) 231-6717, kfelix@vt.edu

MACR Graduate Program http://www.mii.vt.edu
Graduate School Policies http://graduateschool.vt.edu/graduate_catalog/policies.htm
Graduate School Forms http://graduatesschool.vt.edu/academics/forms
Graduate Student Assembly http://www.gsa.graduateschool.vt.edu/
Cranwell International Center http://www.international.vt.edu
Interdisciplinary Graduate Education Program http://interdisciplinary.graduateschool.vt.edu
Macromolecules and Interfaces Institute http://www.mii.vt.edu
Institute for Critical Technology and Applied Science http://www.ictas.vt.edu

## NOTICE

The policies and procedures outlined in this handbook are supplemental – and entirely subordinate – to the general Virginia Tech Graduate School policies and procedures found at http://graduateschool.vt.edu/graduate_catalog/policies.html. Students are responsible for being aware of both MACR *and* Graduate School policies pertaining to their degree programs and individual situations. International students are additionally responsible for awareness of immigration policies and procedures at Virginia Tech.

## GENERAL POLICIES AND PROCEDURES

### Admission

Complete admission policies and procedures may be found at the Graduate School web site (http://www.graduateschool.vt.edu) and the MACR Graduate Program website (http://www.mii.vt.edu). The MACR program administrators evaluate and admit applicants to its graduate programs based on the following criteria:

- Prior academic performance as reflected in university transcripts
    - Courses completed
    - Grades earned
    - Institution(s) where prior degree(s) were awarded
- Preparation as measured by GRE scores
- Mastery of the English language as measured by TOEFL scores and, at the discretion of the Graduate Director, telephone interviews
- Potential to excel in graduate study and research as reflected in letters of recommendation
- Likelihood that the student's interests and motivations are well matched to our graduate program, as indicated by the Graduate School application personal statement

### Orientation Week

All entering students are expected to attend orientation week, which is normally held the week before classes begin in the fall semester, and to participate in all of the activities according to a schedule provided in advance. This week will include tours of facilities, completion of required paperwork, meetings with current students and the Program Director, course advising and registration, and other activities as prescribed in the schedule.

Students on GTA appointments must also attend the Graduate School GTA workshop.

### Choosing a Faculty Advisor

A student's Faculty Advisor is the faculty member with whom the student will work most closely. Other terms for Faculty Advisor include "Major Professor," "Principal Investigator," and "Advisory Committee Chair." Usually, each student will have one advisor, although an arrangement with two co-advisors is also possible. MACR students must choose an individual affiliated with MII as their Faculty Advisor.

During the first semester, an entering student must interview a minimum of four faculty members. A "Faculty Interview Signature Form" is used to document the interviews. Interviews help students select a Faculty Advisor in addition to meeting other professors that

might serve on their Advisory Committees. Therefore, four interviews *must* be completed even though a student may have already identified a Faculty Advisor. Following the interviews, students must complete a "Faculty Advisor Selection Form" to be submitted to the Graduate Degree Program Administrator.

Deadline
The completed "Faculty Interview Signature Form" and "Faculty Advisor Selection Form" must be submitted to the MACR Graduate Program Administrator on or before November 1st. Until a Faculty Advisor is selected, the Director of the MACR Graduate Program will serve as the formal advisor to each entering student.

**Advisory Committee**
Each student shall confer with his or her Faculty Advisor to develop an Advisory Committee consisting of the Faculty Advisor as chair, and at least two other members for MS students (total of three) and at least three other members (total of four) for PhD students. The Advisory Committee must include faculty from at least two departments. The majority of the Committee members must be affiliated with MII – three of five members for PhD students and two of three members for Master's students. Additional guidelines for the composition of the Advisory Committee are provided in the Graduate Catalog.

Deadline
The student must submit a completed Plan of Study with signatures from all Advisory Committee members by the end of the second academic semester in residence for MS students or the end of the third academic semester for PhD students for submission to the graduate school.

**Plan of Study**
Each student shall prepare a Plan of Study for his or her graduate degree using the MACR Plan of Study Form (see page 15, or www.mii.vt.edu MACR Curriculum page). The Plan of Study lists the courses that the student and his/her Advisory Committee agree will provide a background consistent with University and Program requirements, the student's research objectives, and the student's career plans. This Plan shall be signed by the student, the Advisory Committee, and the MACR Graduate Program Director. The completed form should be submitted to the Graduate Program Administrator who will submit the Plan of Study and Advisory Committee Forms 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 Program Administrator.

**Good Standing**
Graduate students must maintain a minimum GPA (QCA) of 3.0 overall, and 3.0 on the courses listed on his or her Plan of Study to remain in "Good Standing." A student who fails to meet this standard will be placed on academic probation by the Graduate School and will have one probationary semester in which to bring his or her grades to 3.0. Otherwise, the student risks dismissal from the program.

Additionally, students are expected to make "satisfactory degree progress," which encompasses research productivity, intellectual growth, and other subjective criteria, in the opinion of the Advisory Committee. Students must submit to annual evaluations by their Faculty Advisors and by their Advisory Committees, as described below.

**Repeating Courses**
Any courses on the Plan of Study for which a student earns below a C- must be retaken. After the second enrollment, the first grade is changed to a Repeat Grade (RG) that does not influence the QCA; the new grade, even if lower, is used. The RG option cannot be used for research credits (MACR 5994, MACR 7994).

**Dropping Courses**
A student may drop a course without penalty through the sixth week of the semester (please refer to the Academic Calendar on the Virginia Tech website). Students must notify the course instructor and Faculty Advisor when dropping a course. Requests are made using a form from the Graduate School. The transcript will be marked "WG" (withdraw-graduate) which does not affect the QCA.

Students on assistantship support must be enrolled for 12 credit hours during the fall and spring semesters. If dropping or withdrawing from a course results in a schedule with fewer than 12 credits, the Graduate Program Administrator (not the student) must add the necessary research credits (MACR 5994, MACR 7994) to make up the difference on the student's schedule.

**Annual Evaluations**
Each academic year, students must submit to an annual evaluation by their Advisory Committees. First year students are evaluated by their Faculty Advisors. Students should prepare a Graduate Student Annual Progress Report and a Research Update form. These forms should be submitted to the Graduate Program Administrator at least one week prior to the Advisory Committee meeting for distribution to Committee members. The Faculty Advisor then prepares an MACR Annual Evaluation Form in consultation with the student's Advisory Committee.

The purpose of the annual evaluation is to ensure that potential problems are identified early and may be corrected. The Advisory Committee will work with the student to develop a plan to rectify any deficiencies and facilitate his or her progress toward completing degree requirements. Students receiving unsatisfactory evaluations must meet with the MACR Graduate Program Director. The Advisory Committee will make recommendations to the student for improvement and a follow-up meeting must be held to ensure the student has implemented suggestions and is demonstrating good progress.

It is the student's responsibility to initiate the scheduling of the annual meeting and to prepare the Annual Report. Failure to demonstrate satisfactory progress may result in the loss of financial support and/or dismissal from the program.

**Appeals & Redress**

We acknowledge that the academic environment should foster VT's Principles of Community (see the Graduate Student Handbook for the Principles of Community) and be upheld by both faculty and students. As such, avenues for redress are outlined and discussed with students during New Student Orientation prior to the start of the fall semester. Our approach includes upholding the dignity and professionalism of aggrieved parties and responding to all complaints within a timely manner. Understanding that every situation is unique, complaints brought to the Graduate School, the Department, or University officials will be reviewed on a case-by-case basis with the emphasis of confidentiality and the goal of conflict resolution front and center. Students can address their complaints with the department administrator, the director of the program, the director of the institute, the Graduate School, or anonymously through the University's Anonymous Tip Form should the situation warrant involvement of local authorities. We whole-heartedly support the larger university's goal and commitment to a bias-free experience "providing an environment of work, study, and leisure/recreation for students, faculty, and staff that is free from all forms of harassment, intimidation, fear, coercion, and exploitation."

**Continual Enrollment**

Graduate students must be continuously enrolled for a minimum of three credit hours in all fall and spring semesters at the University from the time of initial matriculation in the degree program until graduation. Graduate students who need to break their continuous enrollment can do so by applying for a leave of absence through the Graduate School. Any graduate student failing to remain continuously enrolled without approved leave will be resigned from the University. To re-enroll, the student would need to apply for readmission to their academic unit, which is not guaranteed.

In order to maintain funding, students on GTA or GRA appointments must be registered for 12 course hours during the fall and spring semesters.

**Seminar Attendance and Participation**

MACR Students are required to attend all MII seminars. Attendance at seminars provides the student with a broader perspective of the field and of research within the program and the University.

Students are also required to present seminars. Doctoral students must present at least two seminars. The first seminar, a research prospectus, is to be given in the second year of the PhD degree program and should include an outline of their research and any preliminary results that may be available. The second seminar describes the results of their thesis or dissertation research and should be given as a part of the Dissertation defense. Master's students are required to give a seminar as a part of the Thesis defense. Seminars are open to all students and faculty. Seminars and other presentations are excellent occasions for students to obtain speaking experience and to learn how to develop and organize oral presentations.

**Change of Degree Status**

Upon the recommendation of the Faculty Advisor, and with the approval of the full Advisory Committee and the MACR Graduate Program Director, an exceptional student may transfer

to the PhD program without completing the MS degree. With the approval of each member of the Advisory Committee and the Graduate Program Director, the student should submit the Change of Degree Status Form from the Graduate School to the Graduate Program Administrator to be submitted to the Graduate School.

**Research Prospectus/Literature Review**

To initiate the research effort, the student is required to prepare a research prospectus that describes the background, purpose, and methods of research, the outcome anticipated, and the contribution to the field. The prospectus must be in written form and must be presented to the Advisory Committee during its first official meeting. The student should consult with his or her committee regarding expectations for length, scope, and format. The signatures of each committee member on the annual evaluation form signify approval of the proposed research topic, plan, and approach.

A student pursuing a graduate degree should demonstrate the ability to carry out original and creative research, and the results of the research are expected to be sufficiently significant so as to be publishable in technical journals. Thus, the writing style, grammar, and spelling of the prospectus and thesis or dissertation should reflect a high level of skill in written communication.

**Preliminary Examination**

All doctoral students must pass a preliminary examination administered by the Advisory Committee in accordance with Graduate School policies. The preliminary examination is a rigorous test of the candidate's entire program of study consisting of a written and an oral portion. The preliminary exam should be administered no later than the end of the third year. Intent to hold a preliminary exam must be formally declared. Examinations should be scheduled through the graduate school at least two weeks prior to the exam. It is the student's responsibility to schedule the exam through the Graduate School's online signature approval system (https://gradexam.stl.vt.edu). The student must be registered during the semester in which any examination required by the Graduate School is taken.

The preliminary examination is not exclusively for testing factual information, but rather emphasizes critical thinking, analytical problem solving, and the ability to formulate and test hypotheses. In the written portion of the exam, the student must work independently to prepare answers to written questions submitted by the Advisory Committee members. The written portion of the exam must be completed at least one week before the oral portion of the exam is administered. The student is responsible for contacting the entire Advisory Committee to communicate the schedule for the preliminary exam and to request that questions be submitted to the Graduate Program Administrator. Students will receive one set of questions each day during the week of the written portion of the exam and will have 24 hours to prepare and submit a response before the next set of questions is delivered. Responses will be distributed to the Advisory Committee by the Graduate Program Administrator. The oral portion of the exam will include material from the written exam, as well as other areas of the student's program of study. Each Advisory Committee member must signify whether the exam performance was Satisfactory or Unsatisfactory using the online signature approval system. At most, students are allowed one unsatisfactory vote.

If a student fails the preliminary examination, one full semester, a minimum of 15 weeks, must elapse before a second examination may be scheduled. Failure to pass the second examination will result in the student being dismissed from graduate studies by the Graduate School.

**Thesis and Dissertation Preparation**

As the student nears completion, he or she will prepare a dissertation describing the background of their research and current understanding of the topic, the methods used, the data gathered, and the overall discoveries. The student should prepare a preliminary draft for formal review by the Advisory Committee at least *six weeks* before the anticipated defense date. The preliminary draft must be complete and in its final form; all tables and figures must be included and properly formatted. The Graduate School has very detailed policies and procedures dealing with the submission of dissertations and theses. Students are advised to become familiar with these policies in detail well in advance of anticipated graduation. A complete description of policies regarding Electronic Thesis and Dissertation can be found at http://etd.lib.vt.edu/etdformats.html.

**Final Oral Examination (Defense of Thesis or Dissertation)**

All graduate students must have a Final Examination at the end of their degree program. The student must schedule his or her Final Exam using the Graduate School's online exam request system at https://gradexam.stl.vt.edu. The exam request, with date, time, and room, must be entered at least two weeks prior to the date requested for the defense. The student's Advisory Committee members will then receive an email message asking for their approval of the requested exam. In order to approve, each faculty member must certify that he or she has read the dissertation and found it "ready for defense." Therefore, the student should ensure that the Advisory Committee is provided with the thesis or dissertation *four weeks* prior to the desired exam date so that the professors have two weeks to review the document and provide feedback that the student may find useful in revising the final document and preparing for his or her Final Exam. Several regulations apply to the scheduling and execution of Final Exams; the student is advised to consult the Graduate Catalog for details.

Final Exam Scheduling

1. *Schedule and reserve*: Contact each committee member more than 5 weeks in advance of the desired defense date to tentatively schedule the exam (set day and time). This early scheduling will reserve a spot on each committee member's schedule. Then, the student should reserve a room through the appropriate channel.
2. *Distribute the dissertation to the committee*: This **must** be done at least four weeks prior to the defense date. The committee will have two weeks to evaluate the dissertation prior to formally scheduling the defense through the Graduate School. If the committee deems the dissertation "ready to defend," then proceed to step 3. An evaluation of "ready to defend" is an indication that the written work is sufficiently complete such that any recommended changes could most likely be accomplished within the two weeks following the actual defense date. Failure to verify that each committee member deems the dissertation "ready to defend" jeopardizes timely completion of the degree program.

3. *Graduate school scheduling*: At least two weeks prior to the defense date, formally schedule the exam through the Graduate School's online system https://gradexam.stl.vt.edu.

Graduate students must be enrolled for the minimum number of credits in the semester or summer session in which they take the exam *and* in the semester in which they complete a degree. The requirement is 3 credit hours during a semester or summer session, or 1 credit hour for students who qualify for Start of Semester Defense Exception in the semester of their final exam.

Start of Semester Defense Exemption

SSDE is a special enrollment category for students who have fulfilled all requirements, *including advisory committee review and agreement that the thesis or dissertation is ready for defense*, and are registered only to take the final verbal examination. This option is ideal for students who have completed all requirements and finalized the thesis or dissertation, but were unable to defend within the previous term. This option is only appropriate for students who thesis or dissertation can be read and approved by the entire committee prior to or within the first three weeks of the semester. For official information, see: http://graduateschool.vt.edu/academics/commencement_deadlines.

To qualify for SSDE, a student must have:

- completed all requirements (including passing grades on all courses on the plan of study and hold a 3.0 GPA or better), except for the final exam **and**
- submitted the final copy of the thesis to the advisory committee **within the first three weeks of the semester and at least two weeks before the defense date and**
- receive Advisory Committee approval, **who consider the document ready for defense** (to the extent that the student can make corrections and submit the ETD within a two-week period following the defense) within the first three weeks of the semester **and**
- be enrolled in at least three credit hours the preceding semester **and**
- submitted the SSDE form to the Graduate Program Administrator, who will verify that the student meets internal requirements prior to sending the SSDE form to the Graduate School on the student's behalf. This must be completed **by the Friday of the third week of classes or no later than three weeks prior to the defense**, whichever date comes first.

Scheduling a Final Exam within the SSDE Timeline

A student must schedule the defense within the given semester, likely within the first five to seven weeks. Additionally, within the **first three weeks** of the semester the student must:

1. Submit an SSDE form to the Graduate Program Administrator
2. Wait for the Graduate School to enroll the student in one credit (students cannot enroll themselves)
3. Submit Application for Degree in HokieSPA
4. Submit Request for Final Examination (at least two weeks prior to the exam date) in the Electronic Signature System. *NOTE: The entire committee must read and approve the thesis or dissertation prior to signing the online scheduling form.*

International Students

International students who qualify for SSDE *must* defend **within the first five weeks of the semester** to maintain immigration status. *NOTE: Visa status may also be affected.*

Potential Impacts of SSDE

An SSDE will reduce a student's enrollment status to less than full time, possibly affecting:

- Financial aid or loan deferments, assistantships (SSDE students are **not eligible for assistantships, GRA or GTA, or fellowships**), and visa status.
- Fee: http://www.bursar.vt.edu/students_parents/defending_status.php

Students should consult with the Graduate School and the Graduate Program Director to understand the consequences and requirements that result from applying for SSDE.

Submission of Final Thesis/Dissertation

Students have two weeks after the date of the Final Exam to electronically submit their revised thesis or dissertation to the Graduate School (http://etd.vt.edu/guidelines/). Requirements for hard copies should be discussed with the student's Faculty Advisor.

## GRADUATE PROGRAM TIMELINE

Timeline for Progress Toward MACR MS Degree

- By the end of the 2nd academic semester in residence:
    - Approved Plan of Study submitted to the Graduate Program Administrator for online submission to the Graduate School
    - Meeting with Faculty Advisor
        - First evaluation complete
            - Evaluation form filled out by Faculty Advisor, signed by student, Faculty Advisor, and Graduate Program Director
            - Submitted to Graduate Program Administrator to be sent to the Graduate School with a copy retained in the student's file
- By the end of the 4th academic semester in residence:
    - First Advisory Committee Meeting
        - 2nd evaluation complete
            - Evaluation form signed by the student and his/her committee, and the MACR Graduate Program Director
            - Submitted to the Graduate Program Administrator to be sent to the Graduate School with a copy retained in the student's file
- In the remaining years, an annual review will be conducted until the student completes his or her course requirements and is ready to defend.

Timeline for Progress Toward MACR PhD Degree

- By the end of the 2nd academic semester in residence:

    - Meeting with Faculty Advisor
        - First evaluation complete
            - Evaluation form filled out by Faculty Advisor, signed by student, Faculty Advisor, and MACR Graduate Program Director
            - Submitted to Graduate Program Administrator to be sent to the Graduate School with a copy retained in the student's file
- By the end of the 3rd academic semester in residence:
    - Approved Plan of Study submitted to the Graduate Program Administrator for online submission to the Graduate School
- By the end of the 4th academic semester in residence:
    - First Advisory Committee Meeting
        - 2nd evaluation complete
            - Evaluation form signed by the student and his/her committee, and the MACR Graduate Program Director
            - Submitted to the Graduate Program Administrator to be sent to the Graduate School with a copy retained in the student's file
        - Approved research prospectus/literature review completed
            - Approved by Advisory Committee
            - Submitted to Graduate Program Administrator to be included in student file
- By the end of the 5th academic semester in residence:
    - Preliminary examination complete
- In the remaining years, an annual review will be conducted until the student completes his or her course requirements and is ready to defend.

**OMBUDSPERSON**

The graduate student ombudsperson helps graduate students resolve issues and address concerns that arise within the university setting. Acting as an advocate for fairness, the ombudsperson provides information about institutional policies and works to help graduate students manage conflicts, understand the university system, and learn more productive ways of communicating. The office provides a safe place for graduate students to be heard and to receive impartial attention without fear of loss of privacy. Consultations are kept confidential, unless the student grants the ombudsperson permission to discuss issues with involved parties or administrators. See http://www.graduate.ombudsman.vt.edu.

## MACR Faculty Interview & Advisor Selection Form

| **Student's Name:** |
|---|

During the first semester of enrollment, each entering MACR graduate student must interview a minimum of five faculty members. This interview process is designed to introduce the students to the diverse graduate research opportunities at Virginia Tech, and to introduce the MII faculty to the entering class as prospective candidates to join their research groups. Interviews also allow students to meet professors who may later serve on the student's Advisory Committee. For this reason, three interviews must be completed even though a student may have already identified his or her Faculty Advisor.

**Instructions:**

- This form should be printed, filled in by hand, and signed by each faculty member interviewed.
- Upon mutual agreement, the student and proposed advisor should sign the faculty advisor selection statement below.

**The undersigned agree that they have met with the above named student to discuss their research.**

| | Printed Name of Faculty Member | Faculty Signature |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |

The above named student requests to join the research group of:

Prof. _____ (*print name*)

The proposed advisor acknowledges responsibility for financial support of the above named student **beginning after the successful completion of their first year**. Continuation of support through the student's tenure at Virginia Tech is anticipated yet contingent upon financial resources, mutual agreement, and satisfactory progress toward the student's degree requirements.

**The undersigned agree to the terms of this mutual agreement.**

| Printed Name of Student | Student's Signature | Date |
|---|---|---|
| | | |
| **Printed Name of Advisor** | **Advisor's Signature** | **Date** |
| | | |

**Approval of student's selection by signature of the MACR Director:**

| Signature, MACR Director | Date |
|---|---|
| | |

**Proposed Graduate Program of** Student Name: ID Number:

Leading to the Degree of **Ph.D. in Macromolecular Science and Engineering**

**Research Courses:**
MACR 7994 Research and Dissertation – minimum 58 hours for Ph.D. candidates

| Semester | Dept | Course No. | Course Title | Credit Hours | Grade |
|---|---|---|---|---|---|
| Fall 2023 | MACR | 7994 | Research and Thesis/Dissertation | | EQ |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | Subtotal | | |

**MACR Core Curriculum Courses (8 credit hours):**

| Semester | Dept | Course No. | Course Title | Credit Hours | Grade |
|---|---|---|---|---|---|
| | MACR | 5015 | Macromolecular Fundamentals with Lab I | 3 | |
| | MACR | 5016 | Macromolecular Fundamentals with Lab II | 3 | |
| | CHEM/CHE/MSE | 5014 | Technical Oral Communications | 1 | |
| | MACR | 5024 | Writing Skills for Macromol. Sci/Engr. | 1 | |
| | | | | | |
| | | | *Subtotal* | 8 | |

**MACR Electives (6 credit hours):**

| Semester | Dept | Course No. | Course Title | Credit Hours | Grade |
|---|---|---|---|---|---|
| | MACR | 5004 | Graduate Seminar | 1 | |
| | MACR | 5004 | Graduate Seminar | 1 | |
| | MACR | 5004 | Graduate Seminar | 1 | |
| | | | Select one from list of MACR module courses** | 3 | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | *Subtotal* | 6 | |

**select one of these modules courses that is NOT in your major module: CHEM 5705 - Syn Reac Macromolecules, PHYS 5564G - Advanced Polymer Physics, CHE 5204 - Applied Rheology, CHEM 5424G - Advanced Polysaccharide Chemistry

**MACR Modules Courses (9 credit hours):**

| Semester | Dept | Course No. | Course Title | Credit Hours | Grade |
|---|---|---|---|---|---|
| | CHEM | 5174 | Polymer Viscoelasticity | 3 | |
| | CHEM | 6664 | Polymer Morphology | 3 | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | *Subtotal* | | |

**General Elective Courses (9 credit hours):**

| Semester | Dept | Course No. | Course Title | Credit Hours | Grade |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | *Subtotal* | | |

**Total Credit Hours:**

**MACR Courses**

All students must complete the MACR core curriculum courses. Ph.D. candidates must complete 6 credit hours of MACR electives, 9 credit hours of module courses and 9 credit hours of general electives.

Example courses and modules are provided below. Refer to the timetable of classes for timing of course offerings. Requests for transfers or substitutions need to be reviewed and approved by the Program Director/Program Administrator AND the student's faculty advisor.

Research Courses
MACR 7994 Research and Dissertation – minimum 58 hours for Ph.D. candidates

Synthesis Module

| | | |
|---|---|---|
| CHEM | 4534 | Organic Chemistry of Polymers |
| CHEM | 5704 | Synthesis of Macromolecules |
| CHEM | 6564 | Current Topics in Polymer Chemistry |
| CHE | 5984 | Interfacial Chemistry and Engineering |
| CHE | 5984 | Applied Rheology |
| CHEM | 6664 | Amorphous and Crystalline State of Polymers |
| SBIO | 5424 | Polysaccharide Chemistry |
| *Choice of:* | | |
| CHEM | 5505 or 5506 | Advanced Organic Chemistry |
| CHEM | 5535 or 5536 | Synthetic Organic Chemistry |
| CHEM | 5524 | Molecular Structure Determination |

Structure Module

| | | |
|---|---|---|
| CHEM 6674/PHYS 5564G | | Physical Chemistry of Polymers |
| CHEM/ESM | 5174 | Polymer Viscoelasticity |
| CHEM | 6664 | Amorphous and Crystalline State of Polymers |
| CHE | 5984 | Soft Materials and Self-Assembly |
| CHE | 5984 | Dynamic Theory of Complex Fluids |
| PHYS | 4564/5564G | Polymer Physics |

Processing Module

| | | |
|---|---|---|
| CHE 4224/MSE 4524 | | Introduction to Polymer Processing |
| CHE | 5984 | Dynamic Theory of Complex Fluids |
| ESM | 5514 | Viscous Flow |
| ESM/CHSE | 5564 | Non-Newtonian Fluid Mechanics |

Mechanics Module

| | | |
|---|---|---|
| *Choice of:* | | |
| ESM | 5734 | Introduction to Finite Element Analysis |
| ESM | 4044 | Mechanics of Composite Materials |
| ESM | 5014 | Introduction to Continuum Mechanics |

| | | |
|---|---|---|
| CHEM/ESM | 5174 | Polymer Viscoelasticity |
| ESM/CHE | 5564 | Non-Newtonian Fluid Mechanics |
| ESM | 5114 | Viscous Flow |
| ESM | 6104 | Mechanics of Composite Strength and Life |
| ESM | 5074 | Mechanics of Laminated Composite Structures |

Adhesion and Surface Science Module

| | | |
|---|---|---|
| CHEM/ESM/MSE | 5654 | Adhesion Science |
| CHEM/ESM | 5174 | Polymer Viscoelasticity |
| CHEM 5644/CHE | 5334G | Colloid and Surface Chemistry |
| CHEM 7764/PHYS | 5564G | Physical Chemistry of Polymers |
| ESM | 5264 | Mechanics of Adhesive Bonding |
| CHEM | 5524 | Molecular Structure Determination |
| CHE | 5984 | Interfacial Chemistry and Engineering |
| CHEM | 6664 | Amorphous and Crystalline State of Polymers |

Materials in Medicine Module

| | | |
|---|---|---|
| BCHM | 5124 | Biochemistry for the Life Sciences |
| GRAD | 5134 | Polymers in Medicine and Biology |
| CHE 5214/BMES | 5434 | Polymeric Biomaterials |
| MSE/~~ESM~~ BMES | ~~4574~~ 5574G | Biomaterials and Advanced Biomaterials |
| MSE | 5584 | Biomimetic Material Design |
| BMES | 5984 | Fundamentals of Tissue Function, Structure, and Replacement |
| BMES | 5314 | Introduction to Regenerative Medicine I |
| SBIO | 5242 | Polysaccharide Chemistry |
| *Choice of:* | | |
| CHEM | 4534 | Organic Chemistry of Polymers |
| CHEM | 5704 | Synthesis of Macromolecules |
| CHEM | 6564 | Advanced Macromolecular Chemistry |

Composites and Structures Module

| | | |
|---|---|---|
| *Choice of:* | | |
| ESM | 4044 | Mechanics of Composite Materials |
| MSE | 4604 | Advanced Composite Materials |
| ESM | 5074 | Mechanics of Laminated Composite Structures |
| ESM | 6014 | Mechanics of Composite Strength and Life |
| CHEM/ESM | 5174 | Polymer Viscoelasticity |

Micro- and Opto-electronics Module

| | | |
|---|---|---|
| PHYS | 5984 | Opto-Electronic Properties of Polymers |
| *Choice of:* | | |
| CHEM | 4534 | Organic Chemistry of Polymers |
| CHEM 4224/MSE | 4524 | Introduction to Polymer Processing |
| MSE | 4554 | Polymer Engineering |
| *Choice of:* | | |
| EE | 5144 | Introduction to Electro-Optics |
| PHYS | 5614 | Introduction to Quantum Electronics |

**Advisory Committee:**

| | | | |
|---|---|---|---|
| Chair: | [Type NAME here] | Signature | ID Number |
| Co-Chair (optional): | [Type NAME here] | Signature | ID Number |
| Committee Member: | [Type NAME here] | Signature | ID Number |
| Committee Member: | [Type NAME here] | Signature | ID Number |
| Committee Member: | [Type NAME here] | Signature | ID Number |
| Committee Member: | [Type NAME here] | Signature | ID Number |
| Program Director: | [Type Name here] | Signature | ID Number |

_____ _____

**Signature of Candidate** **Date Submitted**

** For non-Virginia Tech committee members, please submit a Graduate Program Faculty & Additional Committee Member Registration form, found on the Graduate School's website.

**Proposed Graduate Program of** Student Name: ID Number:

Leading to the Degree of **M.S. in Macromolecular Science and Engineering**

**Research Courses:**
MACR 5994 Research and Thesis – minimum 10 hours for M.S. candidates

| Semester | Dept | Course No. | Course Title | Credit Hours | Grade |
|---|---|---|---|---|---|
| Fall 2023 | MACR | 5994 | Research and Thesis/Dissertation | | EQ |
| | | | | | |
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| | | | | | |
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| | | | | | |
| | | | | | |
| | | | | | |
| | | | Subtotal | | |

**MACR Core Curriculum Courses (8 credit hours):**

| Semester | Dept | Course No. | Course Title | Credit Hours | Grade |
|---|---|---|---|---|---|
| | MACR | 5015 | Macromolecular Fundamentals with Lab I | 3 | |
| | MACR | 5016 | Macromolecular Fundamentals with Lab II | 3 | |
| | CHEM/CHE/MSE | 5014 | Technical Oral Communications | 1 | |
| | MACR | 5024 | Writing Skills for Macromol. Sci/Engr. | 1 | |
| | | | | | |
| | | | *Subtotal* | 8 | |

**MACR Module Courses (6 credit hours):**

| Semester | Dept | Course No. | Course Title | Credit Hours | Grade |
|---|---|---|---|---|---|
| | CHEM | 5174 | Polymer Viscoelasticity | 3 | |
| | CHEM | 6664 | Polymer Morphology | 3 | |
| | | | | | |
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| | | | | | |
| | | | | | |
| | | | | | |
| | | | *Subtotal* | | |

**General Elective Courses (8 credit hours):**

| Semester | Dept | Course No. | Course Title | Credit Hours | Grade |
|---|---|---|---|---|---|
| | MACR | 5004 | Graduate Seminar | 1 | |
| | MACR | 5004 | Graduate Seminar | 1 | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | *Subtotal* | | |

**Total Credit Hours:**

**MACR Courses**

All students must complete the MACR core curriculum courses. M.S. candidates must complete 6 credit hours from of MACR module courses, 2 credit hours of graduate seminar and 6 additional credit hours of general elective courses.

Research Courses
MACR 5994 Research and Thesis – minimum 10 hours for M.S. candidates

Synthesis Module

| | | |
|---|---|---|
| CHEM | 4534 | Organic Chemistry of Polymers |
| CHEM | 5704 | Synthesis of Macromolecules |
| CHEM | 6564 | Current Topics in Polymer Chemistry |
| CHE | 5984 | Interfacial Chemistry and Engineering |
| CHE | 5984 | Applied Rheology |
| CHEM | 6664 | Amorphous and Crystalline State of Polymers |
| SBIO | 5424 | Polysaccharide Chemistry |
| *Choice of:* | | |
| CHEM | 5505 or 5506 | Advanced Organic Chemistry |
| CHEM | 5535 or 5536 | Synthetic Organic Chemistry |
| CHEM | 5524 | Molecular Structure Determination |

Structure Module

| | | |
|---|---|---|
| CHEM 6674/PHYS 5564G | | Physical Chemistry of Polymers |
| CHEM/ESM | 5174 | Polymer Viscoelasticity |
| CHEM | 6664 | Amorphous and Crystalline State of Polymers |
| CHE | 5984 | Soft Materials and Self-Assembly |
| CHE | 5984 | Dynamic Theory of Complex Fluids |
| MSE | 5504 | Polymer Deformation and Fracture |
| PHYS | 4564/5564G | Polymer Physics |

Processing Module

| | | |
|---|---|---|
| CHE 4224/MSE 4524 | | Introduction to Polymer Processing |
| MSE | 5504 | Polymer Deformation and Fracture |
| CHE | 5984 | Dynamic Theory of Complex Fluids |
| ESM | 5514 | Viscous Flow |
| ESM/CHSE | 5564 | Non-Newtonian Fluid Mechanics |

Mechanics Module

| | | |
|---|---|---|
| *Choice of:* | | |
| ESM | 5734 | Introduction to Finite Element Analysis |
| ESM | 4044 | Mechanics of Composite Materials |
| ESM | 5014 | Introduction to Continuum Mechanics |
| CHEM/ESM | 5174 | Polymer Viscoelasticity |
| ESM/CHE | 5564 | Non-Newtonian Fluid Mechanics |
| ESM | 5114 | Viscous Flow |
| ESM | 6104 | Mechanics of Composite Strength and Life |
| ESM | 5074 | Mechanics of Laminated Composite Structures |
| MSE | 5504 | Polymer Deformation and Fracture |

Adhesion and Surface Science Module

| | | |
|---|---|---|
| CHEM/ESM/MSE 5654 | | Adhesion Science |
| CHEM/ESM | 5174 | Polymer Viscoelasticity |
| CHEM 5644/CHE 5334G | | Colloid and Surface Chemistry |
| CHEM 7764/PHYS 5564G | | Physical Chemistry of Polymers |
| ESM | 5264 | Mechanics of Adhesive Bonding |
| CHEM | 5524 | Molecular Structure Determination |
| CHE | 5984 | Interfacial Chemistry and Engineering |

| | | |
|---|---|---|
| CHEM | 6664 | Amorphous and Crystalline State of Polymers |

Materials in Medicine Module

| | | |
|---|---|---|
| BCHM | 5124 | Biochemistry for the Life Sciences |
| GRAD | 5134 | Polymers in Medicine and Biology |
| CHE 5214/BMES 5434 | | Polymeric Biomaterials |
| MSE/ESM | 4574 | Biomaterials |
| MSE | 5584 | Biomimetic Material Design |
| BMES | 5984 | Fundamentals of Tissue Function, Structure, and Replacement |
| BMES | 5314 | Introduction to Regenerative Medicine I |
| SBIO | 5242 | Polysaccharide Chemistry |
| *Choice of:* | | |
| CHEM | 4534 | Organic Chemistry of Polymers |
| CHEM | 5704 | Synthesis of Macromolecules |
| CHEM | 6564 | Advanced Macromolecular Chemistry |

Composites and Structures Module

| | | |
|---|---|---|
| *Choice of:* | | |
| ESM | 4044 | Mechanics of Composite Materials |
| MSE | 4604 | Advanced Composite Materials |
| ESM | 5074 | Mechanics of Laminated Composite Structures |
| ESM | 6014 | Mechanics of Composite Strength and Life |
| CHEM/ESM | 5174 | Polymer Viscoelasticity |
| MSE | 5504 | Polymer Deformation and Fracture |

Micro- and Opto-electronics Module

| | | |
|---|---|---|
| PHYS | 5984 | Opto-Electronic Properties of Polymers |
| *Choice of:* | | |
| CHEM | 4534 | Organic Chemistry of Polymers |
| CHEM 4224/MSE 4524 | | Introduction to Polymer Processing |
| MSE | 4554 | Polymer Engineering |
| *Choice of:* | | |
| EE | 5144 | Introduction to Electro-Optics |
| MSE | 5214 | Opto-Electronics/Magnetic Applications |
| PHYS | 5614 | Introduction to Quantum Electronics |

**Advisory Committee:**

| | | | |
|---|---|---|---|
| Chair: | [Type NAME here] | Signature | ID Number |
| Co-Chair (optional): | [Type NAME here] | Signature | ID Number |
| Committee Member: | [Type NAME here] | Signature | ID Number |
| Committee Member: | [Type NAME here] | Signature | ID Number |
| Committee Member: | [Type NAME here] | Signature | ID Number |
| Committee Member: | [Type NAME here] | Signature | ID Number |
| Program Director: | [Type Name here] | Signature | ID Number |

_____ _____

**Signature of Candidate** **Date Submitted**

** For non-Virginia Tech committee members, please submit a Graduate Program Faculty & Additional Committee Member Registration form, found on the Graduate School's website.

## MACR COURSES

All students must complete the MACR core curriculum courses. Ph.D. candidates must complete 9 credit hours from one MACR module, 6 credit hours from the remaining MACR modules, and 9 credit hours of general electives. M.S. candidates must complete 6 credit hours from one MACR module and 4 credit hours from the remaining MACR modules.

Research Courses
MACR 7994 Research and Dissertation – minimum 58 hours for Ph.D. candidates
MACR 5994 Research and Thesis – minimum 10 hours for M.S. candidates

Synthesis Module

| | | |
|---|---|---|
| CHEM | 4534 | Organic Chemistry of Polymers |
| CHEM | 5704 | Synthesis of Macromolecules |
| CHEM | 6564 | Current Topics in Polymer Chemistry |
| CHE | 5984 | Interfacial Chemistry and Engineering |
| CHEM | 6664 | Amorphous and Crystalline State of Polymers |
| SBIO | 5424 | Polysaccharide Chemistry |
| *Choice of:* | | |
| CHEM | 5505 or 5506 | Advanced Organic Chemistry |
| CHEM | 5535 or 5536 | Synthetic Organic Chemistry |
| CHEM | 5524 | Molecular Structure Determination |

Structure Module

| | | |
|---|---|---|
| CHEM 6674/PHYS 5564G | | Physical Chemistry of Polymers |
| CHEM/ESM | 5174 | Polymer Viscoelasticity |
| CHEM | 6664 | Amorphous and Crystalline State of Polymers |
| CHE | 5984 | Soft Materials and Self-Assembly |
| CHE | 5984 | Dynamic Theory of Complex Fluids |
| MSE | 5504 | Polymer Deformation and Fracture |
| PHYS | 4564/5564G | Polymer Physics |

Processing Module

| | | |
|---|---|---|
| CHE 4224/MSE 4524 | | Introduction to Polymer Processing |
| MSE | 5504 | Polymer Deformation and Fracture |
| CHE | 5984 | Dynamic Theory of Complex Fluids |
| ESM | 5514 | Viscous Flow |
| ESM/CHSE | 5564 | Non-Newtonian Fluid Mechanics |

Mechanics Module

| | | |
|---|---|---|
| *Choice of:* | | |
| ESM | 5734 | Introduction to Finite Element Analysis |
| ESM | 4044 | Mechanics of Composite Materials |
| ESM | 5014 | Introduction to Continuum Mechanics |
| CHEM/ESM | 5174 | Polymer Viscoelasticity |
| ESM/CHE | 5564 | Non-Newtonian Fluid Mechanics |
| ESM | 5114 | Viscous Flow |
| ESM | 6104 | Mechanics of Composite Strength and Life |
| ESM | 5074 | Mechanics of Laminated Composite Structures |
| MSE | 5504 | Polymer Deformation and Fracture |

Adhesion and Surface Science Module

| | | |
|---|---|---|
| CHEM/ESM/MSE 5654 | | Adhesion Science |
| CHEM/ESM | 5174 | Polymer Viscoelasticity |

| | | |
|---|---|---|
| CHEM 5644/CHE 5334G | | Colloid and Surface Chemistry |
| CHEM 7764/PHYS 5564G | | Physical Chemistry of Polymers |
| ESM | 5264 | Mechanics of Adhesive Bonding |
| CHEM | 5524 | Molecular Structure Determination |
| CHE | 5984 | Interfacial Chemistry and Engineering |
| CHEM | 6664 | Amorphous and Crystalline State of Polymers |

Materials in Medicine Module

| | | |
|---|---|---|
| BCHM | 5124 | Biochemistry for the Life Sciences |
| GRAD | 5134 | Polymers in Medicine and Biology |
| CHE 5214/BMES 5434 | | Polymeric Biomaterials |
| MSE/ESM | 4574 | Biomaterials |
| MSE | 5584 | Biomimetic Material Design |
| BMES | 5984 | Fundamentals of Tissue Function, Structure, and Replacement |
| BMES | 5314 | Introduction to Regenerative Medicine I |
| SBIO | 5242 | Polysaccharide Chemistry |
| *Choice of:* | | |
| CHEM | 4534 | Organic Chemistry of Polymers |
| CHEM | 5704 | Synthesis of Macromolecules |
| CHEM | 6564 | Advanced Macromolecular Chemistry |

Composites and Structures Module

| | | |
|---|---|---|
| *Choice of:* | | |
| ESM | 4044 | Mechanics of Composite Materials |
| MSE | 4604 | Advanced Composite Materials |
| ESM | 5074 | Mechanics of Laminated Composite Structures |
| ESM | 6014 | Mechanics of Composite Strength and Life |
| CHEM/ESM | 5174 | Polymer Viscoelasticity |
| MSE | 5504 | Polymer Deformation and Fracture |

Micro- and Opto-electronics Module

| | | |
|---|---|---|
| PHYS | 5984 | Opto-Electronic Properties of Polymers |
| *Choice of:* | | |
| CHEM | 4534 | Organic Chemistry of Polymers |
| CHEM 4224/MSE 4524 | | Introduction to Polymer Processing |
| MSE | 4554 | Polymer Engineering |
| *Choice of:* | | |
| EE | 5144 | Introduction to Electro-Optics |
| MSE | 5214 | Opto-Electronics/Magnetic Applications |
| PHYS | 5614 | Introduction to Quantum Electronics |

**GRADUATE STUDENT ANNUAL PROGRESS REPORT**
**(To be completed by the student)**

| | | | | | | |
|---|---|---|---|---|---|---|
| Name | | | | | ID# | |
| Degree Program (check one) | MS | | PhD | | Program Entry Date | |
| Faculty Advisor | | | | | | |
| Advisory Committee Members | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| Date of Committee Meeting | | | | | | |

**RESEARCH** (Include a separate Research Update Form)

1. Thesis/Dissertation Title:

2. Presentation(s):

3. Publication(s):

**COURSE WORK**

1. Courses taken this year (attach copy of transcripts):

2. Courses yet to be taken:

**TEACHING**

1. T.A. experience:

2. Courses to which you have contributed (describe participation):

3. Evidence of efforts to improve teaching (workshops, etc.):

**SERVICE**

**AWARDS**

_____
Signature of Faculty Advisor
**Please return signed forms to the Graduate Program Administrator.**

# Annual MACR Graduate Student Evaluation Form

Student Name: _____ Date of Evaluation: _____

Date of Entry (e.g. Fall 2007): _____ Degree Program: MS ☐ PhD ☐

Anticipated Graduation Date: _____ Cumulative GPA: _____

**Student has completed the following:**

☐ POS (up-to-date and on-file at Graduate School)

☐ Literature Review

☐ 1st Research review

☐ Preliminary Exam

☐ Final Exam for MS Degree

☐ Final Exam for PhD Degree

☐ ETD Copyright and Fair Use Check sheet

**Evaluation: Place "X" marks in the boxes.** "Excellent" indicates performance better than the 90th percentile.

| Evaluation Category | Excellent | Good | Marginal | Unsatisfactory | N/A |
|---|---|---|---|---|---|
| Academic Performance | | | | | |
| Research Progress | | | | | |
| GTA Performance | | | | | |
| Professional Activities & Interactions | | | | | |
| Overall Performance | | | | | |

Strengths and Weaknesses:

Anticipated Progress:

Suggestions for Improvement:

| | | | |
|---|---|---|---|
| **Committee Chair** | **Co-Chair (or Member)** | **Committee Member** | **Program Director** |
| **Committee Member** | **Committee Member** | **Committee Member** | **Student** |

## MS Degree Checklist

- By the end of the 2nd academic semester in residence:
  - ☐ Approved Plan of Study submitted to the Graduate Program Administrator for online submission to the Graduate School
  - ☐ Meeting with Faculty Advisor
    - ☐ First evaluation complete
      - ☐ Evaluation form filled out by Faculty Advisor, signed by student, Faculty Advisor, and Graduate Program Director
      - ☐ Submitted to Graduate Program Administrator to be sent to the Graduate School with a copy retained in the student's file
- By the end of the 4th academic semester in residence:
  - ☐ First Advisory Committee Meeting
    - ☐ 2nd evaluation complete
      - ☐ Evaluation form signed by the student and his/her committee, and the Graduate Program Director
      - ☐ Submitted to the Graduate Program Administrator to be sent to the Graduate School with a copy retained in the student's file
- In the remaining years, an annual review will be conducted until the student completes his or her course requirements and is ready to defend.

MACR PhD Degree Checklist

- By the end of the 2nd academic semester in residence:
  - ☐ Meeting with Faculty Advisor
    - ☐ First evaluation complete
      - ☐ Evaluation form filled out by Faculty Advisor, signed by student, Faculty Advisor, and Graduate Program Director
      - ☐ Submitted to Graduate Program Administrator to be sent to the Graduate School with a copy retained in the student's file
- By the end of the 3rd academic semester in residence:
  - ☐ Approved Plan of Study submitted to the Graduate Program Administrator for online submission to the Graduate School
- By the end of the 4th academic semester in residence:
  - ☐ First Advisory Committee Meeting
    - ☐ 2nd evaluation complete
      - ☐ Evaluation form signed by the student and his/her committee, and the Graduate Program Director
      - ☐ Submitted to the Graduate Program Administrator to be sent to the Graduate School with a copy retained in the student's file
    - ☐ Approved project description/literature review completed
      - ☐ Approved by Advisory Committee
      - ☐ Submitted to Graduate Program Administrator to be included in student file
- By the end of the 5th academic semester in residence:
  - ☐ Preliminary examination complete
- In the remaining years, an annual review will be conducted until the student completes his or her course requirements and is ready to defend.