

ATMOSPHERIC SCIENCES (ATM) GRADUATE HANDBOOK 2024-2025 - (Revision: May, 2024)

1. INTRODUCTION

This Handbook outlines the specific procedures and requirements for Ph.D. and M.S. students in the Atmospheric Sciences (ATM) program.

This Guide serves as a **supplement** to the RSMAES and UM Graduate Handbooks which are available in the GSO Student Center on Blackboard.

Students should be aware of all the requirements and procedures in these Handbooks. Students should take full responsibility to follow the procedures and meet the requirements in order to complete their degrees in due time. Any uncertainties regarding the procedures and requirements should be clarified with the ATM Program Director and the RSMAES Graduate Studies Office (GSO).

All progress should be recorded in the students' files at GSO. Information about the necessary forms is available in the RSMAES Handbook.

2. PROGRAM REQUIREMENTS

The applicable requirements will be those in effect during that academic year when the student first registered in the Program, unless stated otherwise in this Handbook or by the Program Director. With advisor's consent, students accepted earlier than 2020 may petition the Program Director to modify requirements to those in the current handbook.

All RSMAES courses are listed on the GSO website. All courses taken by students should be approved by their advisors. Students are recommended to consult with their advisors and the ATM Program Director regarding their choices of courses. Deviations from the requirements must be approved by the advisor and the ATM Program Director.

Doctor of Philosophy

Additional ATM requirements:

- (a) Comprehensive Examination: Grade of PASS or HIGH PASS
- (b) Seminar: Attending the ATM seminar series every semester and giving at least one 15-minute presentation each year after the Comprehensive Examination and a one-hour presentation after advancing to Ph.D. candidacy, and at least 6 months before the dissertation defense.
- (c) For those completing a M.S. degree first, recommendation by the M.S. thesis committee after passing the M.S. thesis defense that the student may enter into the PhD program.
- (d) The ATM Ph.D. degree requires a minimum of **25** course credits. The RSM 771-

773 'Educational Training' courses are non-credit courses.

(e) All ATM Ph.D. students are required to take, or have taken an equivalent in another program, the following courses:

ATM 651	Introduction to Atmospheric Dynamics	3 credits
ATM 652	Introduction to Atmospheric Physics	3 credits
ATM 634	Introduction to Atmospheric Chemistry	3 credits
ATM 765	General Circulation of the Atmosphere	3 credits

****Please note that PhD and MS students cannot take ATM 614 for credit toward the 25-course credit requirement nor is material from this course eligible for the comprehensive exam.**

Material from all required courses, and all other courses taken in the first year may appear on the Comprehensive Examination for Ph.D. candidates. A waiver from taking any of the required courses needs approval by the student's advisor and the Graduate Program Director.

Students may take any other graduate courses offered by ATM, RSMAES, or UM.

PhD candidates in ATM are not required to take a class outside ATM.

A student in the Ph.D. program may request to exit the program and enter into the M.S. Program, as long as he/she does not have an M.S. degree from ATM.

The credit transfer and waiver of required courses should be done during the first year of graduate study at RSMAES with approval from the graduate advisor and the ATM Program Director.

Expectations and Approximate Timeline

Year 1. End of Spring: Comprehensive Exam.

Year 2. Fall or Spring: Form Ph.D. Committee Years 2/3. TA (2 semesters)

Year 3. Fall or Spring: Ph.D. Qualifying Exam and Candidacy

Expectation: Research results of quality equivalent to that of at least one full journal article. Clearly written proposal and timeline.

Years 4-5. Ph.D. Dissertation Submission and Defense

Expectation: Normally the equivalent of 2-3 articles with student as first author that have been or are expected to be published (to be discussed with student's committee).

(f) Academic Probation and Dismissal

If the Faculty Advisor or Committee Chairperson is unsatisfied with a student's research progress, the Chairperson will request a meeting with the

thesis/dissertation committee (if formed) and the ATM Program Director. If a committee has not yet been formed, then the Chairperson will meet with the ATM Program Director. Immediately following the meeting, the Faculty Advisor or Committee Chairperson will send a written notice to the student with the committee's research expectations and inform the ATM Program Director of the meeting outcome. If no improvements are observed by the end of the same semester, a grade of "U" (for Unsatisfactory) may be given for the student's research credits and the student will be on academic probation. One semester of probationary period will be given to the student. If the research performance is still unsatisfactory in the following semester, the student may be dismissed from the Department.

Master of Science

Additional ATM requirements:

- (a) Comprehensive Examination: Students must receive at least a grade of MASTERS PASS.
- (b) Seminar: Attending the ATM seminar series every semester and giving at least one 15-minute presentation each year after the Comprehensive Examination

ATM M.S. students are required to complete at least **24** course credits. The required courses for ATM M.S. students are identical to those for ATM Ph.D. students. The remaining course credits can be obtained by taking other graduate courses offered by ATM, RSMAES, or UM.

Material from all required courses, and all other courses taken in the first year may appear on the Comprehensive Examination for M.S. candidates. A waiver from taking any of the required courses needs approval by the student's advisor and the Graduate Program Director.

M.S. candidates in ATM are not required to take a class outside ATM.

M.S. candidates should submit their thesis proposal to be approved by their thesis committee during the first Spring semester following their Comprehensive Examination. A meeting between the student and the committee to discuss the proposal is expected.

Expectations and Timeline for M.S. Degree

Year 1. End of Spring: Comprehensive Exam

Year 2. Fall: Form M.S. Committee

 Fall or Spring: M.S. Thesis Proposal

- Expectation: Preliminary results and a clear research plan and timeline.
 Spring or Summer: M.S. Thesis Submission and Defense
- Expectation: Research results of quality equivalent to at least one full journal article.

3. EXAMINATIONS

Comprehensive Examination (end of first year)

All M.S. and Ph.D. students are required to take the Comprehensive Examination. For full-time students, the Comprehensive Examination should be taken before or immediately after the end of their first year of graduate studies at RSMAES. This examination will be arranged by a Comprehensive Examination Committee which comprises the ATM Graduate Program Director and the instructors (or assignees) of the first year courses taken by the students.

The purpose of this examination is to evaluate students' understanding of materials in the courses completed up to the time of the examination, and the students' abilities to apply their new knowledge to broader, "big-picture" questions.

The Comprehensive Examination will consist of an oral part and a written part. The written part, which lasts no longer than 8 hours, consists of closed-book questions in the courses taken in the first year by each individual student. Each student must choose to answer questions from four courses (no more, no less). **If the four core ATM courses (651, 652, 634, 765) are offered, then students must answer at least three questions from core classes. If only three of the core ATM courses are offered during that year, then at least two questions from core classes must be answered.** For a given course, you need to answer all the questions (if there are more than one) unless explicitly stated otherwise. The oral part is administered by the ATM Graduate Program Director and course instructors (or assignees) and may include questions from all the courses taken by the student (and for PhD students the exam includes a 15 minute critical review of a short-format peer-reviewed journal article that is assigned by the Program Director in consultation with the student's advisor). The oral exam is scheduled to last one hour.

The GPA comprises 20% of the Comprehensive Exam grade, and the written and oral parts of the Comprehensive Exams comprise 40% each.

A student's performance in this examination, together with his/her cumulative grade point average, will determine whether the grade of HIGH PASS, PASS, MASTERS PASS or FAIL is given by the Comprehensive Exam Committee. The examining board consists of faculty whose questions are answered by the student and any other RSMAS faculty who wish to participate.

Rubric for Comprehensive Examination

	<u>High Pass</u>	<u>Pass</u>	<u>Masters Pass</u>	<u>Fail</u>
<u>Score</u>	4	3	2	1

Written	All parts of problem are answered correctly	Problem may not be answered completely correctly, but the student has shown a solid understanding of fundamental concepts	Student shows some understanding of fundamental concepts, but there are critical gaps	Student has not demonstrated an understanding of fundamental concepts
Oral	Shows a robust understanding of the subject matter	Shows an understanding of fundamental topics, but not a complete understanding of all the subject matter	Shows some understanding of the fundamental topics, but there are critical gaps	Does not show an understanding of fundamental topics

High Pass: for students with no identifiable relevant weaknesses.

Pass: Students and advisors will receive feedback from the Comprehensive Exam committee on the strengths and weaknesses of the student, and possible recommendations of how to address those. This information can be used to help plan the next steps in the student’s academic career.

Masters Pass: Students with this result will be required to defend a Masters thesis before considering whether to pursue a Ph.D. and students with this result will no longer be in the PhD program. Funding (e.g., stipend, health insurance, and tuition) is not guaranteed for students who are moved to the M.S. track with this outcome. Students can be reinstated after defending a Masters thesis and receiving approval from their committee. Advisors will receive feedback from the Comprehensive Exam committee on the strengths and weaknesses of the student, and possible recommendations of how to address those.

Fail: Students with this result may have an opportunity, based on recommendation of the faculty judging the exam, to re-take the exam once.

Ph.D. Qualifying Examination

These guidelines complement those given in the UM Graduate Student Handbook.

All students are expected to take the Qualifying Exam and Proposal Defense by the end of their third year in the program. If the student needs to take the Exam in their fourth year, s/he will need to write a petition to the ATM Faculty with an explanation. A second extension after the end of the fourth year will not be permitted, unless there are exceptional circumstances.

Example of a timeline for the Qualifying Exam and Dissertation Proposal:

Mon Feb 1st: Student gives Dissertation Proposal to Ph.D. Committee

Mon Feb 15th: Student takes written Qualifying Exam

Mon Feb 22nd: Oral Qualifying Exam with Ph.D. Committee

While the exact format is left to the discretion of the Ph.D. Committee, a typical Oral Qualifying Exam comprises of a 30 minute presentation by the student on their proposed research and recent results, questioning from the committee on the proposed research, and then follow-up questions from the committee on the student's written answers. It is recommended that the presentation emphasizes future work and is not a review of previous results, which may be in the written Proposal.

Expectations of the Qualifying Exam

Written Exam – written answers judged by each Committee member to demonstrate that the student has the ability to understand and investigate the concept asked in the question. The questions are usually related to the research described in the dissertation proposal.

Oral Exam –The student may begin the oral exam with an oral presentation that is a review of the proposal, or an update on more recent results, or any other closely related topic. The content of an opening presentation should be decided in consultation with the advisor.

Dissertation Proposal – written by the student in clear English befitting the standard of writing in a peer-reviewed journal. The proposal should demonstrate the capability of the student to produce and present research that is of the quality suitable for a journal article. Emphasis needs to be placed on the proposed research: the questions and hypotheses to be tested, the data and methodology used to test the hypotheses, and some anticipated results (which may or may not be realized). A student is encouraged to discuss the proposal with the advisor, but the writing must be their own. A few critical elements to include are: an abstract, an overarching thesis question that will guide the chapters described in the proposal, research gaps that the thesis will attempt to fill, and a timeline outlining when chapters will be completed and submitted for publication and when the student expects to defend. Students are encouraged to discuss their timeline with the advisor beforehand.

Expectations leading up to the Qualifying Exam

- Communicating with Advisor at least once per month to give research updates.
- Formal establishment of Dissertation Committee, and an initial Committee meeting at least 3 months prior to the Qualifying Exam.

Rubric

Written Exam	Meets expectations	Unsatisfactory
Oral Exam	Meets expectations	Unsatisfactory
Dissertation Proposal	Meets expectations	Unsatisfactory

Decision by Committee

PASS: Meets expectations in all
FAIL: Unsatisfactory in at least one of the written/oral/proposal.

In some cases, the committee may require revisions to a proposal or question, or a retake of the oral exam; but it is not required to retake the entire exam or have a full committee meeting.

4. ATM COURSES (3 credits, unless otherwise stated. Several of these courses will be cross-listed with other programs, especially OCE and MPO). Courses in Bold Type are required for all ATM students.

600-level courses

ATM 611 Geophysical Fluid Dynamics I

ATM 614 Introduction to Weather and Climate **** this class should not be taken by ATM MS/PhD students, students who take this course will not be allowed to apply the credits from this course toward the 25 course credit requirement for the PhD nor the 24 course credit requirement for the MS degree. Nor can it be used for a 1st year comprehensive exam question.**

ATM 624 Applied Data Analysis

ATM 632 Broadcast Meteorology

ATM 633 Atmospheric Boundary Layer

***ATM 634* Introduction to Atmospheric Chemistry**

ATM 636 Hurricanes

ATM 637 Natural Hazards: Atmosphere and Ocean

***ATM 651* Introduction to Atmospheric Dynamics**

***ATM 652* Introduction to Atmospheric Physics**

ATM660 Tropospheric Chemistry I

ATM 653 Climate Change

ATM 654 Climate Variability

ATM 662 Advanced Weather Forecasting

ATM 663 Mesoscale Meteorology and Severe Storms

700-level courses

ATM 711 Geophysical Fluid Dynamics II

ATM 713 Predictability

ATM 731 Air-Sea Interaction

ATM 732 Climate Dynamics

ATM 750 Reaction Kinetics and Molecular Dynamics

ATM 752 Vortex Dynamics

ATM 761 Atmospheric Chemistry II

ATM 762 Computer Models of Fluid Dynamics

ATM 764 Atmospheric and Oceanic Turbulence

***ATM 765* General Circulation of the Atmosphere**

ATM 767 Spectral and Finite Element Methods in Computational Fluid Dynamics

ATM 768 ENSO Dynamics, Prediction and Predictability

Directed Readings

RSM 781 Directed Readings in topics including Cloud Physics, Climate Dynamics, Our Moist Convecting Atmosphere, Special Topics in Atmospheric Chemistry (all 1 credit)

5. TRANSFER OF STUDENTS INTO ATM

A Graduate Program Transfer Form must be completed and placed on file in the RSMAES Graduate Studies Office. It requires signatures from the student, advisor, directors of the original and new programs, and the RSMAES Associate Dean. The Form can be obtained from the ATM Program Director and the Graduate Studies Office.