

Hydrometeorology Program

Doctor of Philosophy (Ph.D.) DEGREE

Departmental REQUIREMENTS

(Updated 7/10/14)

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Note: This document is meant to guide the student through the complicated path of obtaining a graduate degree. It is not to be regarded as a legally binding contract. If you have any questions please ask.

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Commented [GYN1]: Suggested to replace Shirley with and ATMO faculty member; I will talk to Eric

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General Requirements

All doctoral students are personally responsible for taking the following steps at the proper times. All forms must be submitted before the deadline dates as scheduled by the Graduate College. See the ATMO Graduate Coordinator for information on these deadlines and all forms required by the Graduate College Degree Certification office. For assistance with **any** problems, students are encouraged to meet with their Major Advisors, the Graduate Director, the Graduate Coordinator, the Department Head, and/or the Graduate Student Representatives.

All students seeking a doctoral degree must complete a minimum of 63 units of graduate course work.

- 30** units of mandatory graduate course work in their **major** field of study
- 15** units of additional graduate course work related to their **major** field of study
- 18** units of dissertation research
- 63** total units

Students are required to take **30** units of graduate coursework include coursework in atmospheric sciences, hydrology, remote sensing, data analysis and modeling. The following core courses, or their equivalents at other institutions, are required of all students:

MANDATORY CORE COURSES

Fundamentals in Atmospheric Sciences (6 units)

ATMO 541A	Dynamic Meteorology I	3 units
ATMO 551A	Physical Meteorology I	3 units

Fundamentals in Hydrology (6 units)

HWRS 519	Fundamentals in Surface Water Hydrology	3 units
HWRS 524	Hydroclimatology	3 units

MANDATORY ELECTIVE COURSES*

Doctoral students must take 6 units from each of the three areas listed below:

Numerical Weather and Climate Prediction (6 units)

ATMO 541B	Dynamic Meteorology II	3 units
ATMO 558	Mesoscale Meteorological Modeling	3 units
ATMO 574	Weather Analysis & Forecasting I	3 units
ATMO 579	Boundary Layer Meteorology & Surface Processes	3 units

Systems Science and Methods (6 units)

ATMO 545	Intro to Data Assimilation	3 units
HWRS 528	Fund. Systems Approach to Hydrologic Modeling	3 units
HWRS 696F	Advanced Topics in Surface Hydrology & Modeling	3 units
HWRS 542		
ATMO 529	Objective Analysis in Atmos. and Related Sciences	3 units
CE 527	Computer Applications in Hydraulics	3 units

Data Sciences (6 units)

ATMO 529	Objective Analysis in Atmos. and Related Sciences	3 units
CE 527	Computer Applications in Hydraulics	3 units
HWRS 513A	Field Hydrology	2 units
REM 590	Remote Sensing for the Study of Planet Earth	3 units
????	Remote Sensing of Precipitation and Clouds (by Dr. Dong)	
????	Precipitation: observation, analysis, and modeling (by Dr Hazenberg)	

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*If the elective courses are not offered in a particular semester, the student may take an alternative related course after approval of his/her Advisor.

- The remaining elective courses (**15 units**) are of the student's choosing with approval of his/her advisor.
- Currently, there is no official doctoral minor in Hydrometeorology. Consult with the appropriate department if you wish to declare a minor in Atmospheric Sciences or Hydrology.
- Students are required to take a minimum **18 units** of dissertation credit in one of the two departments, ATMO 920 or HWRS 920. It is recommended that these units be taken after the Comprehensive Examination has been passed and are **in addition to** the 45 units of graduate course work.

Typical Doctoral Program:

Semester	Courses	Units
Fall: Year 1	ATMO 541A Dynamic Meteorology I	3
	ATMO 551B Physical Meteorology I	3
	HWRS 528 Fund. Systems Approach to Hydrologic Mod	3
Spring: Year 1	HWRS 519 Fundamentals in Surface Water Hydrology	3
	HWRS 524 Hydroclimatology	3
	ATMO 541B Dynamic Meteorology II *(Elective)	3
Fall: Year 2	ATMO 529 Objective Analysis in the Atmos. and Related	3
	REM 590 Remote Sensing of the Study of Planet Earth	3
	ATMO 545 Introduction to Data Assimilation	3
Spring: Year 2	ATMO 579 Boundary Layer Met. and Surface Processes	3
	Elective Course	3

Fall: Year 3	Elective Course	3
	Elective Course	3
Spring: Year 3	Elective Course	3
	Elective Course	3
Fall: Year 4	ATMO/HWRS 920 (Dissertation)	9
Spring: Year 4	ATMO/HWRS 920 (Dissertation)	9
Total Units		63

** required for working at the NWS*

1. During the first semester, the student should select their Major Advisor. The student and Major Advisor decide on the student's Doctoral Committee members. The examining committee must consist of a minimum of four members. The Major Advisor and two additional members must be tenured, or tenure track. The fourth member may be tenured or tenure-track, or a special approved member. Special members must be pre-approved by the Dean of the Graduate College. Any members beyond the fourth can also be tenured or tenure-track, or special approved members.

2. By the second semester, the student and their Advisor should have decided on the student's **Plan of Study (POS)** through departmental and GradPath forms procedures. The **POS** identifies (1) courses the student intends to transfer from other institutions; (2) courses already completed at The University of Arizona which the student intends to apply toward the graduate degree; and (3) additional course work to be completed to fulfill degree requirements. The **POS** must have the approval of the student's major professor and department head (or chair of the Graduate Committee) before it is submitted to the Graduate College. Once the Graduate College approved the **POS** a \$35 fee will be billed to your Bursar's Account. The POS can be accessed through your UAccess Student. Credits from other institutions the student wishes to transfer should be discussed and may be approved by the Graduate Director and Advisor at this time. Any changes to the original POS must be re-submitted to Graduate College during the final semester.
 - a. If the student obtained their Master's in hydrometeorology then a maximum of 30 units of coursework from the Master's degree taken at the University of Arizona may be applied to the 36 units of course work required for the doctoral program.
 - b. No more than 12 credits listed on the POS may be taken while in non-degree-seeking status. None of the total units listed on the POS can be in courses graded S or P rather than a regular letter grade.
 - c. The transfer of credit form must be filed before the end of the first year of study. The student must complete the **Application to Transfer Coursework** form through GradPath Forms, accessed through your UAccess Student.
 - d. A full program of study, including approved transferred credits, will not be provided to the Graduate College Degree Certification until the student files the POS form.

3. Students must meet the following **minimum** resident/enrollment requirements:
 - a. To meet the minimum Graduate College residence requirements, at least 30 units of graduate credit, in the student's major and/or minor field of study, must be completed at The University of Arizona.
 - b. **Without Assistantships:** Students must spend at least two (2) regular semesters in residence with a minimum of nine (9) units of graduate credit each semester.
 - c. **With Assistantships:** Students must complete four (4) semesters of residency during which they enroll for a minimum of six (6) credits per semester.
4. Students who have not yet passed the written **Qualifying Examination** must notify the Graduate Coordinator no later than September 15th to schedule the examination for October/November of the second year.
5. After completion of all, or almost all, non-dissertation credits required at The University of Arizona including minor requirements, the student must take and pass the **Comprehensive Examination**.
 - a. The student must provide the Graduate Coordinator with at least four (4) weeks notice of his/her intent to take the written Comprehensive Examination and, subsequently, the oral Comprehensive Examination.
6. Students must continue to register each Fall and Spring semester for a minimum of 3 graduate units until all degree requirements are met. If all coursework and dissertation credit requirements have been met then students must continue to register for a minimum 1 credit.
 - a. Doctoral students who have maintained continuous enrollment, fulfilled all their other degree requirements as well as the 18 hours of dissertation and were enrolled in the prior semester may defend in the summer or winter term without registration.

NOTE: If the student enrolls in **only** 900-level courses during his/her final semester, s/he may be entitled to a "900-Level Graduate Tuition Waiver" if living out of state and not using University resources. Please see the Graduate Coordinator for more information.

7. All students must demonstrate, to the satisfaction of each student's Advisor, proficiency in both statistics and computer programming. This may be done by the successful completion of approved courses in these subjects, either at the undergraduate or graduate level.

8. Students must complete and defend a **Dissertation** based on original research.

Doctoral Examinations for the Hydrometeorology Program

Sample Timeline

Semester	Exam
1	
2	
3	Qualifying Examination
4	
5	Written Comprehensive Examination
6	Oral Comprehensive Examination
7	
8	
9	Final Oral Defense

Exam 1: The Qualifying Examination

Purpose: The purpose of the qualifying exam is to evaluate if the student will be able to pursue the doctoral program. It also provides an opportunity to test the understanding of the basic concepts.

When: Beginning of the third semester if the student joins the program without a master's degree. Possible retake the same semester.

Logistics: The student is responsible for completing and submitting the departmental qualifying form to the Graduate Coordinator no later than September 15th your intent to take November examination. The departmental qualifying form is located on our hydrometeorology website.

Format: Combination of written and oral examinations

Written: Four questions, one from each of the core classes taken. The exam lasts two hours, with ½ hour per question.

Oral: Four faculty members, two from Hydrology and two from Atmospheric Sciences are present in the exam, and each administers one question. The faculty member advising the student may not administer a question, but can be present in the examination room. The exam lasts at least two hours, and a maximum of three hours.

Grading: Each of the questions in the written and oral exams are graded as pass (P) or fail (F).

Written: P/F P/F P/F P/F

Oral: P/F P/F P/F P/F

At least 6 passes (P) are required to pass. If the student fails, he/she has the opportunity to re-take the exams within 4 months.

PASS=continue doctoral program

FAIL=may continue towards Masters degree at the discretion of your committee members

Exam 2: The Written Comprehensive Examination

Purpose: The purpose of this exam is to assess the student's ability to think conduct independent research.

The questions should be related to the student's research and should be targeted to help deepen the research.

When:

- During the fifth semester after finishing most of the course work.

Format:

- One open book question coordinated by HWR committee: The student has 1 week to complete the question.
- One open book question coordinated by ATMO committee: The student has 1 week to complete the question.

Grading: Each of the questions in the advanced written exam are graded as pass (P) or fail (F).

P/F P/F

2 passes (P) are required to pass. If the student fails, there is the opportunity to retake the exam within 4 months.

PASS=continue doctoral program

FAIL=may continue towards Masters degree at the discretion of your committee members

Exam 3: The Oral Comprehensive Examination

Purpose: This is the official exam required by the Graduate College. The purpose of the advanced oral exam is two-fold. It will test the student's advanced knowledge of hydrometeorology and it will also evaluate his/her research proposal. The student is required to prepare a 5-page (maximum 10 page) research proposal, and send it to the committee at least 2 weeks in advance of the exam. The proposal should be written in a manner similar to an NSF proposal, presenting the literature review, research hypotheses/questions and proposed methodology to address these questions.

When: Upon successful completion of the Written Comprehensive Examination, the Oral Comprehensive Examination is conducted before the student's examining committee within 6 months of the Written Exam. To schedule the Oral Comprehensive Examination, the student must consult with his/her Graduate Committee to set a date for the oral portion of the exam. It is the student's responsibility to ensure that the date of the oral exam suits the schedules of his/her Committee. Once arranged, the student must then notify the ATMO or HWR Graduate Coordinator in writing (e-mail is accepted) at least 4 weeks in advance to schedule a room, and submit the proposal to the committee at least 2 weeks in advance.

The student is responsible for downloading and filling in the Results of Oral Comprehensive Exam form at <http://grad.arizona.edu/forms> and obtaining the required signatures.

The Oral Comprehensive Examination will be at least two hours long, and a maximum of 3 hours. All committee members must be present (in person or via teleconference) and sign the official document in person or in electronic form.

Format: Short presentation by the student candidate (30min or less). Followed by questions by the committee on both the proposed research and advanced hydrometeorology topics.

Grading: The advanced oral exam is graded as pass (P) or fail (F).

If the student fails the exam, the committee will decide whether the student will be given the opportunity to repeat the exam, however, you must pass this exam before advancing to the next stage.

Exam 4: Final Oral Defense

When: Upon completion of his/her dissertation, the student will take an oral examination in defense of the dissertation. The student must submit copies of the draft dissertation to his/her Graduate Committee no less than one (1) month before taking the Oral Defense Examination.

At least seven (7) working days before the proposed examination date, the student must submit the exact time and place of the examination, and submit the announcement of final examination form to the Graduate College Degree Certification office and arrange for a public announcement in Lo Que Pasa.

Logistics: The student must make all necessary arrangements to schedule the Oral Defense Examination with his/her examining committee. All committee members need to be present in person or via teleconference and sign the official document in person or via fax.

There is no minimum time for the examination, but the entire proceedings, including public seminar, may not exceed three (3) hours.

Grading: The defense examination is graded as pass (P) or fail (F).

The Dissertation

1. A dissertation, to be acceptable, must contribute something useful to the general fund of knowledge in atmospheric sciences. It should be considerably broader in scope than a master's thesis and should present an exhaustive analysis of the problem under consideration. A useful guide is that a dissertation should comprise material for a minimum three publishable papers.
2. The Department will accept dissertations which include published/publishable papers in the format described in Appendix A of *A Manual for Theses and Dissertations*, but acceptance is contingent upon written agreement to this format from the student's Major Advisor.
3. Upon successful completion of the Final Dissertation Defense Examination, the student must submit the dissertation electronically for forwarding to the library of the University of Arizona and to University Microfilms, Inc. The Department requires a third copy of the approved dissertation and abstract for its library.
4. The dissertation **must** comply with all formatting requirements. The Format Check Process is available on the Graduate College website <http://grad.arizona.edu/academics/degree-certification/diss-theses/format-check-process>.
5. The student must submit draft copies of the dissertation to their Graduate Committee at least one (1) month before the Dissertation Defense.
6. Both copies of the dissertation submitted to the Graduate College Degree Certification will be delivered to the UA Library by GDC. Dissertations are published by University Microfilms in Ann Arbor, Michigan, and a fee is charged to cover this expense. Upon certification by the student's Major Advisor, members of his/her examining committee and the Dean of the Graduate College, one copy of the dissertation will be forwarded to University Microfilms, along with the Agreement form. The second copy of the dissertation remains in storage at the UA Library.
7. Publication by microfilm does not preclude publication by other methods later, and successful candidates are urged to submit dissertation material for publication in a scholarly or professional journal. Suitable acknowledgement must always indicate the publication to be a dissertation, or portion of a dissertation, submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at The University of Arizona.

Special Notes

1. Please become familiar with the Departmental forms and procedures located on the hydrometeorology website, as well as the Graduate College forms located in GradPath forms accessed through your UAccess Student.
2. Validation of work by examination is not permitted. No courses taken by correspondence can be used for graduate credit.
3. The cumulative grade point average required for granting the Ph.D. degree is 3.000, based on A = 4.000, B = 3.000, C = 2.000, D = 1.000, and E = 0.000.
4. The grades of D and E do not carry graduate credit, but are included in the grade-point average.
5. The grades of S (Superior) and P (Passing) given for ATMO 920 are not included in the overall grade point average, but are included for graduate credit.