

# **Hydrometeorology Program**

## **Masters of Science (M.S.) DEGREE**

### **Departmental REQUIREMENTS**

*(Updated 8/22/13)*

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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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## General Requirements

Students seeking a master's degree in hydrometeorology must complete 33 units of graduate credit.

**30** units of graduate course work in their **major** field of study

**3** units minimum of research (ATMO/HWRS 900/910)

**33** total credits

Students are required to take 30 units of graduate coursework in Atmospheric Sciences (ATMO) and Hydrology and Water Resources (HWRS). The following core courses, or their equivalents at other institutions, are required of all students:

### CORE COURSES

ATMO 541A	Dynamic Meteorology I	3 units
ATMO 551A	Physical Meteorology I	3 units
HWRS 519	Fundamentals in Surface Water Hydrology	3 units
HWRS 524	Hydroclimatology	3 units

### REQUIRED ELECTIVE COURSES\*

Students must take 6 units from each of the three areas listed below

#### *1) Numerical Weather and Climate Prediction (6 units)*

ATMO 558	Mesoscale Meteorological Modeling	3 units
ATMO 579	Boundary Layer Meteorology	3 units
ATMO 551b	Dynamic Meteorology 2	3 units
<del>ATMO 570/571</del>	<del>Synoptic Meteorology</del>	<del>3 units</del>

#### *2) Systems Science and Methods (6 units)*

HWRS 528	Fund. Systems Approach to Hydrologic Modeling	3 units
ATMO 545	Intro to Data Assimilation	3 units

#### *3) Data Sciences (6 units)*

ARL 590	Remote Sensing for the Study of Planet Earth	3 units
ATMO 529	Objective Analysis in Atmos. and Related Sciences	3 units
HWRS 513A	Field Hydrology	2 units
CE 528	Numerical methods in Hydraulics	3 units

\*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.

Students are required to take a minimum 3 units of ATMO/HWR 900/910 for research credit.

*Typical Masters Program:*

<b>Semester</b>	<b>Course</b>	<b>Units</b>
<b>Fall: Year 1</b>	ATMO 541A Dynamic Meteorology I	3
	ATMO 551B Physical Meteorology I	3
	HWR 528 Fund. Systems Approach to Hydrologic Mod	3
<b>Spring: Year 1</b>	HWR 519 Fundamentals in Surface Water Hydrology	3
	HWR 524 Hydroclimatology	3
	ANTMO 541B Dynamic Meteorology II *(Elective)	3
<b>Fall: Year 2</b> Qualifying Exam	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
<b>Spring: Year 2</b>	ATMO/HWRS 910 Thesis	3
	ATMO 579 Boundary Layer Met. and Surface Processes	3
<b>Total Units</b>		<b>33</b>

*\* required for working at the NWS*

During the first semester, the student should select an Advisor to chair their committee. The student and Advisor then select the Master's Committee members for the student. A Master's committee must consist of a minimum of three members: the Chair (Advisor) and two UA Faculty members. At least two members must be tenure-track faculty. If the third member is not a tenure-track UA faculty member, he or she must be approved by the Graduate College as a special member. A member who is not tenure-track will not be eligible to serve as sole chair of the committee but can serve as co-chair if approved to do so by the Graduate College.

By the end of the second semester, the student and the 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. The student must complete the **Application to Transfer Coursework** form through GradPath Forms, accessed through your UAccess Student.
- b. A maximum of six (6) semester hours of transferred credit may be used to meet degree requirements.

Students must meet the following **minimum** residence/enrollment requirements:

- a. A minimum of 12 credits of work must be done in residence at The University of Arizona. The remaining credits required for the master's degree must be met by University credit, graduate-level courses, including on-campus courses, courses offered away from the main campus, and approved thesis credit *in absentia*.
- b. **Without Assistantships:** Students must enroll with a minimum of nine (9) units of graduate credit each regular semester.
- c. **With Assistantships:** Students must enroll with a minimum of six (6) units of graduate credit each regular semester.

After finishing all course requirements, students must continue to register each Fall and Spring for a minimum of 3 graduate units until all degree requirements are met. If the degree program requirements are to be completed in the summer, the student must register for a minimum of 1 unit of graduate credit during that term. If all course work is completed, the student may enroll in 900 or 910.

- N.B.** 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.

At the discretion of each student's Master's Committee, either a thesis or a scholarly paper on an original **research topic**, judged to be suitable by the student's Master's Committee, must be submitted (Refer to the following section entitled "Research Topic").

- a. A student planning to submit a thesis is required to enroll in ATMO/HWRS 910 in their final semester with a minimum 3 credits.
- b. A student planning to submit a scholarly paper is required to enroll in ATMO/HWRS 900 in their final semester with a minimum 3 credits.

### **Master's Defense**

Upon completion of his/her thesis, the student will take an oral examination in defense of the thesis. The student must submit copies of the draft thesis to his/her Graduate Committee no less than one two weeks before taking the Master's 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. 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.

When the student's Advisor and committee members approve that the student has completed all degree requirements, then the Advisor will contact the Graduate Coordinator to process a **Master's Completion Confirmation**.

**Advancement to the Doctoral program:** A student must have received an average grade of at least 2 As and 2 Bs in the four core courses at the master's level. A student with less than that must have their advisor petition the faculty for a waiver before they can continue. Qualified students who have completed the master's degree in this Department and who wish to continue in the doctoral program must submit a **Request for Change of Degree Program** form. See the Graduate Coordinator for assistance.

- a. When the form is presented to the Department Head for signature, the student's performance in research and course work will be evaluated by the Department's faculty members. The faculty will then recommend whether the student should or should not be permitted to enroll in the doctoral program in atmospheric sciences.

## Research Topic

1. The choice of a research topic is one of the most important decisions confronting the student. The guidance and advice of the student's Advisor should help in making the decision. Although there are no specific rules, the following principles may be helpful:
  - a. The problem should require the use of material covered in at least some part of the graduate course program.
  - b. Although master's-level research is carried out under the close supervision of a faculty member, some element of originality on the student's part should be involved. In other words, the problem itself may be new, or a new approach or new method of analysis may be applied to an old problem.
  - c. The problem should be carefully limited in scope. A thorough piece of work on a small problem is generally satisfactory, while a sketchy development of a large problem is not generally acceptable.
  - d. The research problem cannot be secret or classified in the military sense.
  - e. Except in certain special cases, collaboration of two or more students on one thesis is not allowed.

## The Thesis

1. The Graduate College has prepared a detailed **Manual for Theses and Dissertations** for use by graduate students at <http://grad.arizona.edu/academics/degree-certification/diss-theses/manuals>. To be accepted, all theses must comply with these instructions.
2. In general, a thesis should be written in as concise a manner as possible, never exceeding a few tens of pages in length. A lengthy, "padded" manuscript will not be accepted. Note, also, that responsibility for adequate writing standards rests with the student.
3. Each student should be aware that all members of their Master's Committee must read the thesis and approve it prior to its being accepted by the Department. Therefore, the student **must** allow ample time for their master's committee to accomplish this prior to the student's proposed graduation date which may otherwise be delayed if the student fails to do so. The Department requires a minimum of two weeks before the end of the semester.
4. A copy of the final approved thesis must be provided to the Department.
5. Neither the Department nor the Graduate College requires that the thesis be submitted to the Graduate College. Should the student choose to submit their thesis to the Graduate College, two (2) copies of the completed thesis, conforming to the requirements of the Graduate College and approved by the Department, and an abstract of 150 words or less must be deposited with the Dean of the Graduate College at least 15 days before the date on which degrees are awarded.
  - a. A thesis fee is paid to the University Cashier to cover the cost of microfilming which becomes the archival copy in the UA Library.



## The Scholarly Paper for Publication

1. An alternate procedure for satisfying the master's research requirements, one preferred by most students, is to write a paper that is judged by the student's Master's Committee to be acceptable for publication in a scientific journal.
2. Such a paper is generally much shorter in length than the usual master's thesis and must be written in accordance with the format of the U.S. journal to which it will be submitted. The student's Master's Committee will not normally judge a paper to have satisfied the master's requirement until this procedure has been followed.
3. Graduate students are expected to write clear and logical accounts of their work in the English language. The Master's Committee may reject a manuscript that is poorly written. The best way a student can learn to write an acceptable paper is through practice, coupled with a careful review of papers on a similar topic that have appeared in the literature. Detailed derivations and explanations are necessary only when they are original and do not appear elsewhere. Another option to improve writing is by attending the Graduate Writing Institute offered in June for three weeks, see their website for further information at <http://grad.arizona.edu/gwi> or attend Graduate/International Writing Workshops offered each semester by the Writing Skills Improvement Program, <http://wsip.arizona.edu/workshop-series>.
4. Figures should be limited and carefully selected for information content. Generally, there should not be more than one figure per typewritten page.
5. Although the requirement states that the paper has only to be suitable for publication and not actually submitted for publication, the latter is implied. It is certainly to the student's advantage to have a paper published, especially if s/he plans to make a career of research.

## Special Notes

1. Please become familiar with the Departmental forms and procedures located on the program website, as well as the Graduate College forms located in GradPath forms accessed through your UAccess Student.
2. Full graduate credit will be given to graduate courses taken no more than six (6) years before the completion of degree requirements. Course work more than 6 years old will not be accepted toward meeting the degree requirements.
3. Validation of work by examination is not permitted. No courses taken by correspondence can be used for graduate credit.
4. The cumulative grade point average required for granting the master's degree is 3.000, based on A = 4.000, B = 3.000, C = 2.000, D = 1.000, and E = 0.000.
5. The grades of D and E do not carry graduate credit, but are included in the grade-point average.
6. The grades of S (Superior) and P (Passing) given for 900/910 courses and are not included in the overall grade point average, but are included for graduate credit. In special circumstances, grades of C, D or E may be given for 910; such grades will be used in computing the overall grade point average.
7. Students who change their plans regarding submission of a thesis versus a manuscript must proceed as follows:
  - a. To change from manuscript to thesis, students should enroll in 3 credits of ATMO/HWRS 910 in their final semester. Nothing else needs to be done.
  - b. To change from thesis to manuscript, students should enroll in ATMO/HWRS 900 in their final semester for a minimum 3 credits. ATMO/HWRS 910 credits must be deleted from the Plan of Study when the Completion of Master's Degree Requirements form is submitted to the Department Head for signature.