



Hydrometeorology Program Doctoral (Ph.D.) DEGREE

Departmental REQUIREMENTS

Valid for AY 2017-2020

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NOTE: This document is meant to guide the student through the 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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History & Purpose

HISTORY

The UA's Department of Hydrology and Atmospheric Sciences now offers the nation's first graduate degree program (MS, PHD), with a major in Hydrometeorology. The terrestrial water cycle includes both the atmospheric component--water vapor, clouds, and precipitation--and the land component--surface and subsurface runoff, infiltration, evapotranspiration, snowmelt, river flow--which play a major role in the weather and climate and strongly affects human activities.

Historically, the science of hydrology has focused on land-related processes and has relied on prescribed atmospheric inputs, generally from observations or atmospheric model outputs, or through empirical estimates derived from conventional meteorological measurements. In contrast, while the atmospheric sciences generate hydrologically-relevant forecasts, they tend to avoid dealing with the details of processes influencing feedbacks generated by the land surface. In establishing a firm linkage between the two, the program asks the following questions:

- What is the science involved with the interface of water in the atmosphere and water on the ground?
- What are the ramifications for predictive capabilities when these processes are incorporated into coupled numerical weather and climate models?
- What are the new applications in water quality, and how are water quality issues linked to precipitation and related runoff issues?
- How is the full understanding of the hydrologic cycle from "white water" to "blue water"--from precipitation to streams to oceans to water vapor to precipitation--related to the advancements in prediction and related societal benefits that link back to the water quality issue?

PURPOSE

- Educate students by providing them with (1) a well-rounded background in the fields of atmospheric, hydrologic, and systems sciences, (2) the tools and methods for numerical

modeling, prediction, and data assimilation (surface hydrology, weather and climate), and (3) the sensors, data sources, and data manipulation tools, including remote-sensing and geographic information systems (GIS)

- Partner with various national and international weather and climate forecasting agencies to identify critical hydrometeorological knowledge gaps, to support, encourage, and facilitate research in multidisciplinary hydrometeorological science, and to work towards improved forecasts and forecast support, particularly over arid and semiarid regions such as the Western US
- Serve the hydrometeorological science and operational communities by coordinating meetings and workshops seeking to build consensus related to hydrometeorological science and to assist in the transfer of advances in understanding into the decision-making arena

WHY HYDROMETEOROLOGY?

Hydrometeorologists mainly study both the atmospheric and terrestrial phases of the hydrological cycle, with emphasis on the interrelationship between them (i.e. the transfers of water and energy between the land surface and the lower atmosphere). Accordingly, the science of hydrometeorology bridges across both hydrology and meteorology. For example, hydrometeorologists are interested in the study of natural hazards of hydrometeorological origin and the mitigation of their effects. Among these hazards are the results of natural processes or phenomena of atmospheric, hydrological or oceanographic nature, such as floods, tropical cyclones, drought and desertification, and the potential impacts of land-cover change and changing climate. Major and important processes of interest to hydrometeorologists are precipitation and evapotranspiration, and also how the land surface partitions energy into different components (sensible, latent, ground heat flux) and how this then affects the overlying atmosphere. Only recently have academic degree programs dedicated to the study of hydrometeorology been formed, such as the program here at the Department of Hydrology and Atmospheric Sciences at the University of Arizona!

COURSE REQUIREMENTS

Students seeking a doctoral degree in hydrometeorology must complete a minimum of 64 units of graduate coursework. This program is prescribed, the courses listed below are the only approved courses for the program. There is no minor, hydrometeorology is considered the minor in your Plan of Student (POS). No course substitutions are permitted at this time.

45 units of graduate course work in their major field of study

1 unit of seminar

18 units minimum of thesis research

64 total units

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

ELECTIVE COURSES

Students are required to **take a minimum of two courses (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 Met. & Surface Processes	3 units
ATMO 551B	Dynamic Meteorology II	3 units
ATMO 574A	Weather Analysis & Forecasting I	3 units
ATMO 574B	Weather Analysis & Forecasting II	3 units

2) Systems Science and Methods (6 units)

HWRS 505	Vadose Zone Hydrology	3 units
HWRS 528	Fund. Systems Approach to Hydrologic Modeling	3 units

ATMO 545	Intro to Data Assimilation	3 units
ATMO 555	Intro to Remote Sensing in Atmo. & Hydro	3 units

3) Data Sciences (6 units)

REM 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 Methods	2 units
HWRS 513B	Field Hydrology Synthesis	1 unit
HWRS 543A	Risk Assessment for Environmental Systems	3 units
CE 527	Computer Applications in Hydraulics	3 units

*Highlighted courses are in the process of being approved by the HAS Academic Committee

A Typical Doctoral Program:

Semester	Degree Requirements	Units
Fall: Year 1	ATMO 541A Dynamic Meteorology I	3
	ATMO 551A Physical Meteorology I	3
	HWRS 595A Current Topics in HAS	1
Spring: Year 1	HWRS 519 Fundamentals in Surface Water Hydrology	3
	HWRS 524 Hydroclimatology	3
	ATMO 541B Dynamic Meteorology II *	3
	<i>Qualifying Exam</i>	
Fall: Year 2	ATMO 529 Objective Analysis in the Atmos and Related	3
	HWRS 528 Fund. Systems Approach to Hydrologic Mod	3
	ATMO 555 Intro to Remote Sensing in Atmo & Hydr	3
Spring: Year 2	ATMO 579 Boundary Layer Met. and Surface Processes	3
	HWRS 513A Field Hydrology Methods	2
	HWRS 513B Field Hydrology Synthesis	1
Fall: Year 3	ATMO 574A Weather Analysis & Forecasting I	3
	REM 590 Remote Sensing for the Study of Planet Earth	3
	HWRS 543A Risk Assessmt. For Environ. Systems	3
Spring: Year 3	ATMO 574B Weather Analysis and Forecasting II	3
	ATMO 545 Introduction to Data Assimilation	3
	<i>Comprehensive Exam</i>	
Fall: Year 4	ATMO/HWRS 920 Dissertation	9
Spring: Year 4	ATMO/HWRS 920 Dissertation	9
	<i>Final Oral Defense</i>	
	<i>Submit Dissertation</i>	
TOTAL Units		64

* required for working at the NWS

GENERAL REQUIREMENTS

MAJOR ADVISOR

During the first semester, the student should select a Major Advisor to chair their committee. The student and Major Advisor then select the doctoral committee members for the student. At least three members must be tenure-track faculty. If one or more members 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. Students may change major professors with departmental approval, but are required to have a major professor in order to maintain Satisfactory Academic Progress.

ARIZONA RESIDENCY

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

- A. A minimum of 12 units must be completed 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*.
 - a. **Without Assistantships:** Students must enroll with a minimum of nine (9) units of graduate credit each regular semester to maintain a full-time student status.
 - b. **With Assistantships:** Students must enroll with a minimum of six (6) units of graduate credit each regular semester. **However, GAs hired under the Department of Hydrology and Atmospheric Sciences must enroll with a minimum of nine (9) units of graduate credit each regular semester.**

CONTINUING STUDENT STATUS

After finishing all course requirements, students must continue to register each Fall and Spring for a minimum of 1 graduate unit 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 ATMO/HWRS 920.

NOTE: If the student enrolls in **only** 900-leveled courses during his/her final semester, s/he may be entitled to a "900-Leveled Graduate Tuition Waiver" if living out of state and not using University resources. Waiver covers out-of-state tuition costs only. In-state tuition and mandatory fees are not covered by this waiver. Please see the Graduate Coordinator for more information.

QUALIFYING EXAMINATION

If students have successfully completed their MS degrees in HAS, received at least 2 A's and 2 B's in the core courses, and received an unanimous endorsement from their MS defense committee members [i.e. checked box on MS defense form], they may have the qualifying exam waived at the advisor's request. Failure to either take the exam or to pass the exam after two attempts means that students may not continue in the program (*Refer to the following section entitled "Qualifying Exam", page 16*).

RESEARCH

At the discretion of each student's doctoral committee, an original research topic, judged to be suitable by the student's doctoral Committee, is required. A student must submit a written dissertation proposal and scholarly papers as a final dissertation. (*Refer to the following section entitled "The Research Topic", page 23 and "The Dissertation", page 24 for more detail*).

REQUIRED DEMONSTRATION OF COMPETENCE

A. All students must demonstrate, to the satisfaction of each student's Major Advisor, proficiency in both statistics and computer programming (e.g. FORTRAN, MatLab, GrADS, and NCL), numerical atmospheric models and specialized instrumentation Participation in laboratory or field work may be a component. This may be demonstrated by the successful completion of approved courses in these subjects, either as an undergraduate or graduate student.

AND

- B. All students, will be required to present the results of their research in a formal seminar or presentation at a scientific meeting in the form of an oral or poster presentation. Typically a student presents at the annual El Día de Agua y la Atmósfera (Spring), AGU (December) or AMS (January) meetings.

GRADPATH & DEPARTMENTAL FORMS

The Graduate College requires all doctoral students to complete official forms in GradPath forms through the UAccess Student. The department may require internal forms to be completed in addition to GradPath forms. Please see the Graduate Coordinator for more information.

- Responsible Conduct of Research
- Evaluation of Transfer Credit
- Doctoral Plan of Study (POS)
- Comprehensive Exam Committee Appointment
- Announcement of Doctoral Comprehensive Exam
- Results of Comprehensive Exam
- Prospectus/Proposal Confirmation
- Doctoral Dissertation Committee Appointment
- Announcement of Final Oral Defense
- Results of Final Oral Exam/Defense

PLAN OF STUDY

By the end of the second semester, the student and their Major Advisor should have decided on the student's Doctoral Plan of Study (POS). You may use the departmental POS to help in your decision making with your major advisor. Please see the Graduate Coordinator for the internal form. The POS must have the approval of the student's Major Advisor and the Director of Graduate Studies before it is submitted to the Graduate College. Once the Graduate College approves the POS, a \$35 fee will be billed to your Bursar's Account. Credits from other institutions the student wishes to transfer should be discussed and may be approved by the Graduate Director and Major Advisor at this time. Any changes to the original POS must be re-

submitted to Graduate College during the final semester. **The Responsible Conduct of Research and Evaluation of Transfer Credit forms must be completed before the Doctoral Plan of Study.**

1. **Responsible Conduct of Research Form:** “Fostering a culture and expectation of responsible and ethical conduct of research is a critical component in the advancement of knowledge through research and scholarship. It is a key element in the maintenance of public trust in the research enterprise.” Source: UA Office of Research, Discovery, and Innovation. All students must complete the Responsible Conduct of Research (RCR) Statement form. Additionally, an RCR Workshop is required for any student who is financially supported by an NSF, NIH, or NIFA grant.
2. **Evaluation of Transfer Credit Form:** Submit this form during the first or second semester in residence to obtain approval for any potential Transfer Credit (graduate-level coursework already completed) for later use in the Doctoral Plan of Study. Discuss details with the Director of Graduate Studies.
3. **Doctoral Plan of Study Form:** All courses taken, future courses (major and minor), transfer courses, and dissertation units must be included in the form.

TIME LIMITATION

All requirements for the degree of Doctor of Philosophy must be completed within 5 years of passing the Comprehensive Exam. Programs may have more stringent time to degree requirements. Should a student not finish within that time period, he or she may be allowed to re-take the Comprehensive Exam with permission of the program, and then proceed to complete other requirements, e.g., the dissertation.

COMPREHENSIVE EXAMINATION FOR ADVANCEMENT TO CANDIDACY

Before admission to candidacy for the doctoral degree, the student must pass a written and an oral Doctoral Comprehensive Examination. This examination is intended to test the student's comprehensive knowledge of the major and minor subjects of study, both in breadth across the general field of study and in depth within the area of specialization. The examination, therefore, should not take place until the student has completed all, or almost all, of their coursework. The student must be in good academic standing to sit for the comprehensive exam. The

Comprehensive Examination is considered a single examination, although it consists of written and oral parts. Normally, the written and oral portions of the comprehensive examination should take place at least three months prior to the Final Oral Examination (defense of dissertation).

Upon successful completion of the written portion of the examination, the Oral Comprehensive Examination is conducted before the examining committee of the faculty. The oral portion of the examination must cover both the major and the minor. Remote participation by one or more committee member by video or phone conference is permitted on the condition that the student and all committee members can effectively communicate. All members must participate in the entire examination. The oral examination is the occasion when faculty committee members have both the opportunity and obligation to require the student to display a broad knowledge of the chosen field of study and sufficient depth of understanding in areas of specialization. Discussion of proposed dissertation research may be included. The examining committee must attest that the student has demonstrated the professional level of knowledge expected of a junior academic colleague.

The Graduate College allows no more than one re-take of the oral exam. When the student has passed the written and oral portions of the Comprehensive Examination, and the Graduate Student Academic Services office has confirmed completion of the required courses on the approved doctoral Plan of Study, the student will advance to doctoral candidacy. The student will be billed the graduate candidacy fees and will be notified by e-mail of the advancement and fees. The candidacy fees are one-time fees and the student will not be billed again if the reported graduation date is changed. (*Refer to the following section entitled "Comprehensive Exam", page 18*).

DISSERTATION AND FINAL ORAL DEFENSE

All Ph.D. programs require the completion of a dissertation which meets required standards of scholarship and demonstrates the candidate's ability to conduct original research. A common measure of quality of the dissertation is whether it is "publishable" in disciplinarily-recognized publication venues. Note that the determination of whether a dissertation meets this criteria lies solely with scholars on the dissertation committee. Programs and committees may not require that

the work actually be published. Instructions relating to the format of the dissertation and required abstracts are included in the Dissertation Formatting Guide (including those that include previously published papers, papers accepted for publication, and/or papers with multiple authors). (*Refer to the following section entitled "The Dissertation", page 24*).

Upon the completion of the dissertation, the candidate must submit to a Final Oral Defense Examination. A student must be in good academic standing to schedule the defense. The examination focuses on the dissertation itself but can include general questioning related to the field(s) of study within the scope of the dissertation

The date, time, and location of the final examination must be scheduled with the Graduate College in advance using the Announcement of Final Oral Defense form in GradPath. This form should be submitted far enough in advance of the examination that all approvers can grant their approval in time for the form to reach the Graduate College one week prior to the exam. The Graduate College will place an announcement on the UA master calendar to invite the public to attend the candidate's presentation of his or her work. Final Oral Examinations should be scheduled during days when the university is in session and during normal business hours. Permission to hold examinations during University holiday closures or outside of normal university business hours may be granted by Graduate College.

The dissertation director presides over the examination. The initial seminar portion during which the student presents the dissertation and entertains questions is open to the public. This is followed by a closed session with just the committee and the candidate. The committee's deliberation is closed to the public.

There is no minimum time limit for the Final Oral Examination, but the entire proceedings may not exceed three hours. Members of the committee must be present for the entire examination. Should special circumstances require a member to attend remotely, prior permission from the Graduate College is necessary.

If the committee requires revisions, those must be done in a timely manner, not to exceed one year. If the revisions are not completed by the dissertation submission deadline for the term when the student defends, the student will be required to register for the next semester and will graduate in the semester when the revisions are complete and approved. If revisions are not done by the end of the time to degree period, the student will have to re-take comprehensive examinations to

demonstrate currency of knowledge. (*Refer to the following section entitled "Final Oral Defense", page 21*).

The Qualifying Examination

PURPOSE

- To test the student's basic understanding of their general field of study, ability to communicate their research interests, and potential for doing PhD-level research.
- Provide feedback on graduate coursework that may help in student's research and/or career goals.
- Increase students and faculty exposure to each other's research interests.

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 submitting the written component to the Graduate Coordinator no later than September 30th for Fall or February 28th for Spring. The student will receive a Qualifying Exam form to receive signatures from faculty after each meeting. The Graduate Coordinator will assign the four HAS core faculty, will notify each faculty, and send the student's written component to review. The student is responsible for contacting each faculty to arrange meetings. Please allow a minimum of two weeks for faculty to review your research proposal. You have until the last day of classes to complete the oral component of the exam and return the signature page to the Graduate Coordinator.

FORMAT

The qualifying exam is a combination of written and oral components.

Written Component: Graduate Fellowship Research Application (GFRA). Students must submit a short (typically 2-6 pages) research proposal in the format of one of the following graduate fellowship programs: NSF, EPA, NASA, or NOAA. Alternative fellowship formats may be used with prior approval by the HAS Graduate Committee.

Proposals must be submitted no later than February 28th of the student's 2nd semester, if starting in August; Proposals are due Sept. 30th if starting in January. Students are encouraged, but not required to submit the fellowship application to the funding agency.

*All written components for the PhD Qualifying or Comprehensive exams should have 1" margins, 12 point New Times Roman font (or similar), and be single-spaced.

Oral Component: Q&A with 4 Faculty following submission of GFRA. Two weeks after submission of the Graduate Fellowship Research Application, students must schedule 20-minute individual meetings with 4 tenured/tenure-track faculty members in the department (3 in their program of study, and 1 from another PhD program within HAS). The meetings should all take place within 1 week if at all possible. The Graduate Academic Advisor will assign the 4 faculty members to the PhD Qualifying Exam Committee. Those faculty members will evaluate the student's research application prior to the meeting, and ask the student questions during the Q&A related to their research to test the breadth of their knowledge about their field of study and provide feedback on coursework potentially relevant for their PhD research and career goals.

GRADING

The written and oral exam will be graded Pass/Fail. Students must receive a "passing" grade from at least 3 of the 4 faculty members on both the written and oral components to pass the qualifying exam. If students fail the written exam, they may submit a revised research proposal within one month of receiving notice that they failed the first exam. If students fail the oral exam, they may retake the oral exam within one month of receiving notice that they failed the first oral exam.

The Comprehensive Exam

PURPOSE

- Evaluate student's breadth of understanding across degree.
- Evaluate student's depth of understanding in their chosen field of research, writing and presentation ability, and ability to conduct original research.
- Enable student's PhD Committee members (or Comprehensive Examination Committee) to provide feedback on research directions.

WHEN

Should be completed as soon as all major coursework requirements have been completed (usually in the 3rd year or 4th year). Core Courses: Must earn at least 2 As and 2 Bs in the 4 core courses.

LOGISTICS

The student is responsible for completing their GradPath Forms and submitting the written components directly to their major advisor and comprehensive committee members. Please allow a minimum of two weeks for faculty to review your written components. No more than 6 weeks allowed between the written and oral component of the examination.

GradPath Forms to Complete:

- A. Comprehensive Exam Committee Appointment Form:** Committee members must include a minimum of 3 HAS tenured or tenure-track faculty. A fourth member may be a UA tenured or tenure-track faculty member or an approved Special Member. A special member could be a UA non-tenured research scientist, a non-UA faculty member from another university, or an approved scientist from an external agency or laboratory. See the program coordinator for advice about obtaining Special Member approval.
- B. Announcement of Doctoral Comprehensive Exam Form:** This form is submitted upon approval of your written components for your comprehensive exam. Must include the exact date and time of your oral component.

- C. **Results of Comprehensive Exam Form:** Submitted electronically by your faculty advisor and/ committee chair. Candidacy fees are charged to your student Bursar Account upon advancement to doctoral candidacy.
- D. **Prospectus/Proposal Confirmation Form:** Send a copy of your dissertation abstract to the program coordinator when you initiate the Comprehensive Exam process. The verification form is submitted by the Graduate Coordinator.

FORMAT

The comprehensive exam is a combination of written and oral components.

Written Components:

- Dissertation abstract. Students must submit a 1-page abstract of their dissertation to their PhD comprehensive examination committee and the Graduate Academic Advisor to have on file with the Graduate College to initiate their PhD comprehensive exams.
- Manuscript/Publication or Research Proposal. Student must submit either a first-authored research manuscript (“in prep”, “in review” or “published”), or a research proposal.
 - Research manuscript (“in preparation” or “in review”) formatted to be submitted to a peer-reviewed scientific journal. If the student already has a paper published from their PhD research, they can submit the paper to their examination committee and automatically pass this portion of the exam.
 - Research proposal (at least 10 pages, including figures/tables, but not including references; formatted in typical NSF EAR directorate style).

Oral Component: Presentation of student’s research manuscript/paper or proposal (~30 minute presentation), followed by Q&A by committee members. 2 hours maximum. All members must participate in the entire examination. The oral examination is the occasion when faculty committee members have both the opportunity and obligation to require the

student to display a broad knowledge of the chosen field of study and sufficient depth of understanding in areas of specialization.

GRADING

The written and oral exam will be graded Pass/Fail. Students must receive a “passing” grade from at least 3 of the 4+ faculty members on both the written and oral components to pass the comprehensive exam. If students fail the written exam, they may submit a revised manuscript or proposal within two months of receiving notice that they failed the first exam. If students fail the oral exam, they may retake the oral exam within two months of receiving notice that they failed the first oral exam.

THE UA NONDISCRIMINATION AND ANTI-HARASSMENT POLICY

The PhD qualifying and comprehensive exams are subject to the University of Arizona non-discrimination and anti-harassment policy. If you have any concerns or questions, please see <http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy>, and/or contact the HAS Director of Graduate Studies.

The Final Oral Defense

LOGISTICS

The student is responsible for scheduling with committee members a day and time of the exam and reserving a room, and completing their GradPath Forms and submitting the written components directly to their major advisor and comprehensive committee members. Please allow a minimum of two weeks for faculty to review your written components. No more than 6 weeks allowed between the written and oral component of the examination.

GradPath Forms to Complete:

- A) **Doctoral Dissertation Committee Appointment Form:** The Graduate College requires a minimum of three members, all of whom must be current University of Arizona faculty members that are tenured, tenure-track, or approved as tenure equivalent. If a committee has only three members, all must approve the dissertation. In departments that require four or five members, there may be one dissenting vote. The fourth member may be tenured or tenure-track, or an approved special 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 approved special members. All dissertation committee members are expected to attend the entire final defense.
- B) **Announcement of Final Oral Defense Form:** (Must be submitted and approved at least 10 business days before the exam date.)
- C) **Results of Final Oral Defense:** (Submitted electronically by your faculty advisor.)

FORMAT

The final oral consists of a 45 minute public presentation with Q & A. Following the presentation, the remainder of the session will closed to public and include the student and their doctoral committee members. There is no minimum time limit for the Final Oral Examination, but the entire proceedings may not exceed three hours. Members of the committee must be present for the entire examination. Should special circumstances require a member to attend remotely, prior permission from the Graduate College is necessary.

GRADING

If the committee requires revisions, those must be done in a timely manner, not to exceed one year. If the revisions are not completed by the dissertation submission deadline for the term when the student defends, the student will be required to register for the next semester and will graduate in the semester when the revisions are complete and approved. If revisions are not done by the end of the time to degree period, the student will have to re-take comprehensive examinations to demonstrate currency of knowledge.

Upon successful completion of the Final Oral Defense examination, and having gained final approval from the dissertation committee after completing any revisions needed following the defense, the candidate submits the dissertation electronically via the submission website maintained by ProQuest/UMI. This submission must be made by the submission deadline for the desired graduation term. The Graduate College will check the formatting of the submitted dissertation and may request changes before accepting the submission. When the dissertation has been accepted by the Graduate College, completion of requirements has been fulfilled, and all other final items are accounted for, the degree will be awarded provided the degree conferral date for the graduation term has been reached. Please refer to the Academic Calendar for the relevant semester for the conferral date.

The Research Topic

The choice of a research topic is one of the most important decisions confronting the student. The guidance and advice of the student's Major 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 doctoral-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 Dissertation

Dissertation Formatting Guide Below can also be found on the Graduate College's website, <https://grad.arizona.edu/gsas/dissertations-theses/dissertation-and-thesis-formatting-guides>.

Dissertation Formatting Guide

I. Introduction

Congratulations on reaching the final stage of your graduate program! Your dissertation, DMA document or DNP project (*dissertation* hereafter) is the culmination of your graduate work and deserves a professional presentation. There are a few specific requirements in this guide, but otherwise you are expected to present your work in the best form for your discipline and your intended audience, following the guidance of your committee.

The required elements of the dissertation include specifically formatted front matter (the first few pages) and a few principles to follow. Please review the information below when you are preparing your dissertation.

II. Required Pages (Front Matter)

The first two pages of your dissertation must be:

- Page 1: Title page
- Page 2: Committee approval page

There are samples of both these pages available on the Graduate College web site, showing their formatting. These samples are found at <http://grad.arizona.edu/degrecert/samples-templates>. You may adapt one of these sample pages for your use – make sure to replace the sample information with your own. (If you are doing a document or practice inquiry, be sure to replace “dissertation” with the proper term.) Some tips and instructions for these pages follow.

A. Title page

- Follow the capitalization shown in the sample.
- You should reference your department by its official name. If your major does not match the name of the department, you need to include “WITH A MAJOR IN _____” below the degree name.

B. Committee Approval page

Option 1: Your Graduate Coordinator will use Adobe Sign to gather signatures for your approval page. Once the chair/co-chairs and committee members have all signed, you will include that signed approval page as page 2 in your dissertation.

Option 2: If your chair/co-chairs and committee members prefer to physically sign your approval page at the final defense, please follow these instructions:

- Download a sample page at <https://grad.arizona.edu/gsas/dissertations-theses/sample-pages> to prepare your approval page. Be sure to use the correct version, depending on whether you have one committee chair, or co-chairs. Type your name, dissertation title and the names of the members who will participate on your final exam committee. Use your defense date as the date for the signature lines.
- Next, print out a hard copy to take to your defense and get the signatures of all your committee members. **Note: Make sure you print this page in color for the watermark to show properly.** Your committee chair/co-chairs will need to sign the form twice (as a member and as chair/co-chair). If a member or chair attends the defense remotely, scan the page, have them sign and send back to you. When all signatures are received, scan the signed approval page and insert it as page 2 of your dissertation. Keep the original for your records. DO NOT add to ETD ProQuest as a supplementary file.

C. Acknowledgements and Dedication (optional)

- If you include an Acknowledgements page, it should be on the next page directly following the Committee Approval page.
- The next page, if you include it, would be the Dedication.

D. Table of Contents

- The Table of Contents follows the title page, approval page, and the Acknowledgements and/or Dedication (if included).
- All chapters and major sections of the dissertation that appear after the Table of Contents should be reported.
- You may decide how many levels of sub-headings you wish to report in the Table of Contents. Be consistent – if you report some headings of a given level, you should report all of them. Different levels of heading are normally distinguished in the Table of Contents by indenting.
- Each heading reported in the Table of Contents should match the heading in the body of the dissertation and should have its page number reported.
- We recommend using a dot leader (e.g. “.....”) between each heading and its page number on the far right, for the ease of the reader.

E. Lists of Figures/Illustrations and Tables

- If your dissertation includes figures, it is helpful to include a List of Figures following your Table of Contents to identify the figures and report the pages where they appear.
- Similarly, a List of Tables is helpful if your dissertation includes tables.
- You may number your figures and/or tables using any method that will

make sense to your readers.

F. Abstract (*Required*)

- You **must** include your abstract prior to the first chapter of the dissertation, and following all other front matter.

III. Formatting Principles

A. Fonts

- It is best to use a standard serif font, as they reproduce well.

B. Headings

- Different levels of heading should each have a distinct and consistent appearance. Ideally, the reader should know at a glance what level a given heading is based on its appearance.

C. Margins

- Dissertations that are archived and retrieved electronically in .PDF format do not need to abide by specific margins.
- If you are ordering bound copies of your dissertation from ProQuest/UMI when you submit it for archiving, you will want to use margins appropriate for binding: 1.5" on the left, and 1" at the top and bottom.

D. Page Numbers

- Page numbers should appear on all pages (although the title page does not need to display its page number), in the same place on each page.
- The title page is considered page 1 of the dissertation, with all other pages numbered successively.
- If you include scanned material with page numbers, please ensure that the reader can easily find the dissertation page number on any page.

E. Citations

- You should use the citation style appropriate for your discipline, following the guidance of your committee.

F. Footnotes/Endnotes

- You may use footnotes or endnotes as appropriate.
- There is no specified format for footnotes or endnotes.

G. Appendices

- You may include material in appendices as appropriate.
- Appendices appear following the chapters of the dissertation, and before the final References section.
- Typically each appendix has a letter designation and a title (e.g. "APPENDIX A – SUPPLEMENTARY DATA").

H. References/Bibliography

- The final section of the dissertation should be a comprehensive list of the works you have cited or used.
- As noted above, the Graduate College does not specify a citation style to use.

IV. Manuscript/Article-Based Dissertations

A. Manuscript/Article-Based Dissertation Option

- At the option of the student and the committee, an alternate format permitting inclusion of papers published or prepared for publication in scholarly journals may be used.
- The decision to allow the inclusion of previously published or submitted work in a dissertation is left to the candidate's degree-granting unit.
- The published or publishable work must be logically connected and integrated into the dissertation in a coherent manner. Simply binding reprints or collections of publications together is not acceptable as a dissertation in either format or concept.

B. Presentation of Articles and their Academic Context

- Published/publishable papers should be included in the dissertation as appendices. Any paper or article that has been published or submitted for publication should reference the journal of submission so the reader can find the published article.
- However, in order to provide coherency, the dissertation must also include chapters that present a summary of the research, an explanation of the student's contribution if it was not individual research, and an explanation of how this research contributes to the student's field.
- The committee will guide the student in presentation of this summary material.
- If references are cited in the dissertation chapters, they should be reported in a References section that follows the chapters and precedes the appendices.

V. Other Considerations

A. Filing for Copyright

- While your dissertation is your own intellectual property, you may elect to file your copyright with the Library of Congress to secure additional legal protection.
- For information about copyrighting, please review the information available on the Graduate College web site at <http://grad.arizona.edu/academics/degree-certification/diss-theses/copyrighting>. There is contact information there for the copyright expert at the University Library should you have questions.
- When you submit your dissertation for archiving, you will be asked

whether you wish to file for copyright.

- i. If you decide to file for copyright, please be sure to use the correct version of the Statement by Author.
- ii. If filing for copyright, you will be charged a fee by ProQuest/UMI when you submit your dissertation. This money will be used to register the copyright for your dissertation in your name.

B. Use of Copyrighted Material

- Use of copyrighted material in your dissertation, including illustrations, usually requires written permission from the copyright holder. Start this time-consuming process as early as possible. Play it safe and assume that you must obtain permission if the material is copyrighted.
- Notice of permission granted for the use of copyrighted material should either be included in the dissertation (likely as an appendix) or be included in a supplementary file submitted with the dissertation for archiving.
- The use of small fractions of a musical score or other document without explicit permission is governed by the concept of “fair use.” Factors weighed in determining “fair use” include: the purpose of the use, whether commercial or nonprofit and educational; the nature of the copyrighted work; the amount and substance of the material used in relation to the entire work; and the effect of the use upon the potential market for or value of the copyrighted work. See The University of Arizona’s Fair Use checklist for more information <https://new.library.arizona.edu/research/copyright/fair-use>

C. Requirements for Contemporaneous Enrollment and Research

- The research that is described in the dissertation must have been conducted during the time the candidate was enrolled in his or her current degree program and cannot have been submitted toward any other degree at the University of Arizona or elsewhere.

D. Archived dissertations (UA Library)

- You can find dissertations and theses archived by past UA graduates in the archive maintained by the University Library at <https://repository.arizona.edu/handle/10150/129649>

VI. Submission of the Dissertation

A. Timing

- You will submit your dissertation for archiving after you have successfully defended and gained final approval from your committee. If your committee requires you to make revisions following your defense, your revisions must have been completed and accepted by the committee before you submit the dissertation.
- In order to graduate in a given term, you must submit your dissertation by the submission deadline published on the Graduate College site (<http://grad.arizona.edu/academics/degree-certification/deadlines-for-graduation>). Note that the submission deadline falls before the final day of the

term, so plan your defense with the deadline in mind.

B. The Submission Procedure

- You will submit your dissertation online via the submission web site:
<http://www.etsadmin.com/arizona>
- This is not a UA site, so you will begin by establishing your profile in the submission system.
- Once you have established your profile, you can follow the step-by- step instructions on the site to make yours submission.
- Publishing option: You will be asked to select either Traditional or Open Access publishing.
 - i. Traditional publishing: There are no fees charged for traditional publishing, under which ProQuest/UMI will sell your dissertation to a customer who requests it and will forward a very small royalty to you. Note that your dissertation will be available for free in the University Library's repository if people search for it there.
 - ii. Open Access publishing: If you elect Open Access publishing, you pay an additional fee to ProQuest/UMI, and they will then make your dissertation available for free from their archive. Note: All dissertations and theses are available for free from the University Library's repository whether or not you pay for Open Access publishing through ProQuest/UMI.
 - iii. The copyrighting fee will be charged by ProQuest/UMI if you elect to file for copyright when you submit your dissertation for archiving.
- Your Degree Counselor in the Graduate College will review your dissertation submission and will e-mail you to tell you whether any formatting changes are needed. Note that the e-mail will be sent to the address in your submission profile and may be caught in your spam filter.
- You will receive a confirmation email when your dissertation has been accepted. The dissertation will be published based on your selection of whether and how long to delay release. Any changes to the dissertation post publication may incur a fee.

C. Other Steps to Complete

- In addition to having the formatting of your submitted dissertation cleared by the Graduate College, there are a few other steps you need to complete.

Please review the information at <http://grad.arizona.edu/academics/degree-certification/diss-theses/format-check-process>.

- This checklist of the required steps to finish your dissertation submission process is also available for download as the "Dissertation Checklist" from <https://arizona.app.box.com/file/50869187777>

Special Notes

- Please become familiar with the Departmental forms and procedures located on the HAS website, as well as the Graduate College forms located in GradPath forms accessed through your UAccess Student.
- Full graduate credit will be given to graduate courses taken no more than six (6) years before the completion of degree requirements. Coursework more than 6 years old will not be accepted toward meeting the degree requirements.
- Validation of work by examination is not permitted. No courses taken by correspondence can be used for graduate credit.
- 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.
- The grades of D and E do not carry graduate credit, but are included in the grade-point average.
- The grades of S (Superior) and P (Passing) given for 900-leveled and independent study courses 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; such grades will be used in computing the overall grade point average.