**METEOROLOGY AND ATMOSPHERIC SCIENCE**

**GRADUATE STUDENT HANDBOOK**

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**Section 1. Classification and Advising of Students**

**Graduate Degrees Offered in the Department of Meteorology and Atmospheric Science**:

* Ph.D., M.S.
* Integrated B.S./M.S. Program in Meteorology and Atmospheric Science
* Dual-Title Graduate Degree (Ph.D.) in Astrobiology
* Dual-Title Graduate Degree (Ph.D.) in Climate Science

The graduate program embraces topics that span atmospheric processes from those of the planetary boundary layer to those of the upper atmosphere, that encompass phenomena from weather to climate with molecular to planetary dimensions, and that range from practical to theoretical significance. The program develops and integrates approaches based on observational, computational, and analytical techniques, and seeks to advance both fundamental understanding and predictive skill.

The major interests of the faculty and graduate students include (1) mesoscale- and synoptic-scale weather systems; (2) climate and earth system dynamics; (3) atmospheric physics including radiative transfer and cloud physics; (3) atmospheric chemistry, air quality and the earth’s biogeochemical cycles; (4) atmospheric turbulence, boundary layers, land-atmosphere interactions, ocean-atmosphere interactions, and ocean-ice-atmosphere interactions; (5) geophysical fluid dynamics, (6) physical oceanography, and (7) climate and weather risk. Methodological approaches include numerical modeling, data assimilation, atmospheric remote sensing, field observations, atmospheric data analysis, and laboratory studies.

The requirements for the M.S. and Ph.D. degrees are different. A person granted an M.S. degree will have demonstrated a broad, thorough knowledge of the major areas within the atmospheric sciences as well as an ability to complete and summarize a research study. Accordingly, a successful M.S. candidate must write and defend a thesis or paper approved by three committee members and the Department Associate Head of the Graduate Program. The Master's program normally requires two years to complete.

A person granted a Ph.D. degree will have demonstrated, in addition to the broad level of knowledge required of an M.S. candidate, both an expertise in an area of the discipline and an ability to perform independent, creative research within that area. Accordingly, the successful Ph.D. candidate must pass four exams, the Qualifying, Technical English Competency, Comprehensive, and Final Oral Exams, and must write a dissertation summarizing the performed research. The Ph.D. committee has at least four members of the Graduate Faculty and is normally chaired by the candidate's adviser. The Ph.D. program may require up to five years to complete, an additional four years after an M.S. is earned.

Most students are classified as degree students in either the M.S. or the Ph.D. program. A student may be classified as provisional, but this classification is only a temporary one.

**1.1 Academic Status**

A graduate student is expected to maintain at least a 3.00 cumulative grade point average and to have obtained a research supervisor by the end of his or her second semester in residence. If a student maintains this average and has obtained a research supervisor, then this student will retain regular academic status.

The progress of a student in the graduate program will be monitored closely by the student’s thesis committee, the Chair of the Graduate Academic Program (GAP) committee, and the Associate Head of the Graduate Program. A formal review of all students will be performed by the Associate Head and the Chair of GAP after each spring semester. A student’s transcript through the recently completed spring semester, and an updated student and adviser's report on research progress (same as the annual progress report) will be considered in the review.

The program of a graduate student will be terminated for unsatisfactory scholarship if both of the following conditions are met:

1. The student's overall Grade Point Average (GPA) remains below 3.00 for two

consecutive semesters (not including METEO 600 credits), or if the student receives a D or F in any semester;

1. The student’s committee reports that a student’s efforts in research or teaching are of an unacceptably low quality.

The student will be notified of this decision according to Graduate School policy. In such cases the Associate Head, after consultation with the appropriate faculty, might recommend that the student consider finishing the requirements for a second B.S. degree in meteorology if the student's first B.S. or B.A. is in another field.

If either of the above two conditions are met, then the Associate Head, after consultation with the appropriate faculty, will summarize the actions that must be taken by the student during the following semesters for adequate progress on eliminating the above deficiencies. Each subsequent semester, the Associate Head and appropriate faculty will ascertain whether this student has demonstrated sufficient progress to be allowed to remain in the graduate program.

**1.2 Student Committees and Advisers**

Incoming graduate students may consult with the Associate Head for the Graduate Program about their course selections for the first academic year and on how to proceed to obtain a research assistantship. Each student is expected to select a research topic or have received a research assistantship within the first academic year.

Once a research topic has been identified, each student must form a committee composed of the student’s adviser and two other faculty members familiar with the research area. One of these two members may be from another institution if appropriate. Each semester, the committee should meet informally with the student to review the student’s progress toward the degree and to offer advice as needed. The Graduate Staff Assistant in 501A Walker has a form on which is listed the members of this committee.

Soon after passing the Ph.D. Qualifying Exam, each Ph.D. student must form a regular Ph.D. committee having at least four Graduate Faculty members, at least one of whom is from outside the Department of Meteorology and Atmospheric Science. Committee members from other institutions can be added as special members, beyond the minimum of the four Penn State members. A committee signatory page must be obtained from the Graduate Staff Assistant in the department. Note that the Graduate School must be notified of the membership of the regular Ph.D. committee at least three weeks before the student’s Comprehensive Exam is scheduled.

**1.3 Academic Progress**

The department requires each student to complete an annual progress report. The report is due to the Associate Head for the Graduate Program by June 1 every year, and will be used in the annual review that summer of each student's progress through the spring semester. For this report, fill out appropriate form for a [M.S. student](http://www.met.psu.edu/academics/graduate-studies/handbook-graduate-students/selected-forms/GradProgressReportForm-MS-April2014.docx/view) or a [Ph.D. student](http://www.met.psu.edu/academics/graduate-studies/handbook-graduate-students/selected-forms/GradProgressReportForm-PhD.docx/view). Moreover, a student remaining at a certain level for a period longer than noted in [Table 7](http://ploneprod.met.psu.edu/academics/graduate-studies/handbook-graduate-students/selected-forms/Table7.docx/view) is considered to be making unsatisfactory progress toward the degree.

**1.4 Course Registration**

Students should register on the web via [LionPATH](https://lionpathsupport.psu.edu/) well in advance of the first day of classes – by the end of October for the following spring semester, and by late March for the following summer session and the following fall semester. Students are strongly encouraged to register as soon as possible so that adjustments in course offerings can be made in a timely fashion. Students may register for or drop courses during the first week of classes at no charge, but after the first week there is a nominal charge for making changes. Course controls have been placed on Meteorology 590, 596, 600, 601, 610, and 611. A student will need to have these courses added manually to his or her schedule by the Graduate Staff Assistant, in the Meteorology Department, Main Office, 501A Walker Building.

**1.5 International (F-1 and J-1) Students**

The Immigration and Naturalization Service (INS) has regulations that pertain to international students with F-1 and J-1 visas. Each student is responsible for learning about and abiding by these regulations. Students or faculty who have questions regarding these regulations should contact the Penn State University [Office of Global Programs](https://global.psu.edu/) or may e-mail questions to [dissa-adviser@psu.edu](mailto:dissa-adviser@psu.edu). International graduate students need to maintain full academic status at all times.

It is advisable to frequently check <https://global.psu.edu/category/international-students> for updates. This website contains detailed information about the SEVIS fee, rules and regulations governing international students, such as change of address, maintaining status, necessary immigration documents, authorization for off-campus employment, health insurance, taxes, dependent visas (if you want to move your spouse here, for example), obtaining a driver’s license, and Social Security.

**Section 2. University Course Regulations**

**2.1 Maximum Credit Loads**

The maximum number of credits for which students holding regular or supplemented assistantships (see Section 5) may register are restricted by the Graduate School. These limitations are summarized in Table 1 and apply to all 400-, 500- and 600-level courses except audits and METEO 601. For most M.S. and pre-comprehensive Ph.D. students on assistantships, this number is 12 credits in both the fall and spring semesters. In a particular semester, more credits than those listed may be taken, provided that fewer are taken in subsequent semesters so that the annual total does not exceed that implied by the table. Note that a student holding an assistantship may take more than 12 credits in a fall or spring semester or more than 5 credits in the summer only with the written permission of the Department Head or Associate Head of the Graduate Program. Without such approval, the department may terminate the assistantship.

Although credit limits for the summer are listed, most graduate students holding research assistantships in the fall and spring semesters do not register in the summer, but are paid on a summer assistantship. Except in the summer, students holding fellowships register for the same number of credits as those holding assistantships, unless required otherwise by the grantor.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 1**. Maximum Credit Loads for Graduate Students Supported by Assistantships or Fellowships  **Fall and Spring Semesters Summer Session** | | |  | |  |  |  | |
| Status | | Total Credits | Status | Total Credits |  | |  |  |
| No Assistantship | 15 | No Assistantship | 12 | |  |  |  | |
| Regular Assistantship | 12 | Assistantship | 5 | |  |  |  | |
| Supplemented Assistantship | 8 | Fellowship | 6 | |  |  |  | |
| Fellowship | 12 |  |  | |  |  |  | |

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**2.2 Grades**

The following +/- grading system is used for both undergraduate and graduate students: A, A-, B+, B, B-, C+, C, D, or F. Grade point averages are based on a four-point scale, with an A being 4.00, a B, 3.00, etc. All graduate students are required to maintain at least a B, or 3.00, average. The grade R, which denotes satisfactory progress and which is not used in calculating a grade point average, may be used in the courses listed in Table 2 below.

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|  |  |
| --- | --- |
| Number | Title |
| METEO 590+ | Colloquium |
| METEO 600\*, 610\* | Thesis Research |

**Table 2**. Meteorology Courses Usually Graded with R

+ A grade of C is assigned by the student's adviser for unsatisfactory attendance.  
\* Quality grades (A–F) are given in these courses for 6 credits for thesis-option M.S. students

and for up to 12 credits for Ph.D. students.

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**2.3 Transfer of Graduate Credits taken by Undergraduates**

Up to nine 400- or 500-level credits taken while a student was a meteorology undergraduate at Penn State may be applied to the 30 credits needed for an M.S. degree or to some of the credits required for a Ph.D. degree, if these credits were not required to meet the baccalaureate degree requirement. The letter grades for these courses transfer to the graduate transcript. Students who obtained their baccalaureate degrees from institutions other than Penn State or students who graduated from Penn State in a major other than meteorology may also apply for transfer of up to ten junior/senior or graduate credits. The grades in these courses must be a B or better; the grades do not appear on the graduate transcript, however. Any student interested in doing so must first contact the undergraduate institution and have the credits transferred to the graduate transcript. Then the student should contact the office of Graduate Enrollment Services in 114 Kern Building (814-865-1795).

**2.4 Second B.S. Degree in Meteorology**

In some cases, the department may recommend that a student seek a second baccalaureate degree instead of a graduate degree. Students who wish to do so follow these four steps:

1. Contact the Ryan Family Student Center in Earth and Mineral Sciences to discuss the overall procedure and what additional courses might be needed to complete the BS degree.

2. Formally withdraw from the Graduate School; do this at 114 Kern Building. Students will be asked to explain in writing why they wish to do so.

3. Apply for admission as an undergraduate student. Students must fill out the standard application form, pay the fees, and apply for admission as a student with advanced standing. The university requires high school and college transcripts to accompany this application. This process may require one to two weeks.

4. Once accepted as an undergraduate student, contact the Records Office in 112 Shields Building to transfer all Penn State graduate credits to the undergraduate record. Courses such as METEO 590 and 600 will not transfer.

**Section 3. Degree Requirements - M.S.**

**3.1 Summary of Degree Requirements**

Requirements listed here are in addition to requirements stated in the [DEGREE REQUIREMENTS](https://bulletins.psu.edu/graduate/programs/majors/meteorology-atmospheric-science/#degreerequirementstext) section of the Graduate Bulletin.

**Course requirements**. The M.S. degree is offered with thesis or research paper options, both requiring 35 credits.

A minimum of 35 credits at the 400, 500, 600, or 800 level is required, with at least 29 credits at the 500, 600 and 800 level combined. The required core curriculum consists of 23 credits, including 12 credits in four distinct courses, two each from two prescribed lists for dynamic meteorology and physical meteorology. The dynamic meteorology list consists of METEO 520 (3 credits), METEO 521 (3 credits), METEO 554 (3 credits), METEO 551 (3 credits), and METEO 570 (3 credits). The physical meteorology list consists of METEO 532 (3 credits), METEO 533 (3 credits), METEO 535 (3 credits), METEO 556 (3 credits), and METEO 570 (3 credits). In addition, students must complete at least 2 credits of METEO 880 or METEO 596, at least 2 credits of METEO 590, 1 credit of METEO 591, and 6 elective credits from 500-level Meteorology and Atmospheric Science courses or 500-level courses in related disciplines from a list of approved electives maintained by the program office.

Students can choose to complete either a thesis or a scholarly paper as the culminating experience for the degree. Students who choose the thesis track must select METEO 880 and 6 additional elective credits from 400- and 500-level course work in Meteorology and Atmospheric Science or related disciplines from a list of approved electives maintained by the program office. In addition, students must complete 6 quality-graded credits in thesis research (600 or 610) in conjunction with completing the thesis (quality-graded credits count toward the grade-point average). The thesis must be accepted by the advisers and/or committee members, the head of the graduate program, and the Graduate School, and the student must pass a thesis defense.

Students in the scholarly paper track must select 2 credits of METEO 596, 6 additional elective credits from 400- and 500-level course work in Meteorology and Atmospheric Science, and 6 additional credits from 400- and 500-level course work in Meteorology and Atmospheric Science or related disciplines from a list of approved electives maintained by the program office. Students in the scholarly paper track cannot count METEO 600 credits towards degree requirements. Students will complete the scholarly paper while registered for 2 credits of METEO 596 in their final semester. M.S. students in the scholarly paper track must defend their scholarly paper in a public presentation that is evaluated by, and must be approved by, the students' committee.

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Table 3. Required Minimum Credit Distribution for M.S. Students in Meteorology and Atmospheric Science

***All M.S. students must take the required meteorology core***:   
METEO 591 (1 credit; first fall semester)  
METEO 590 (1 credit/semester, minimum 2 credits)  
METEO 500-level course elective (6 credits)  
METEO 500 or Related Discipline 400- or 500-level course electives (6 credits)   
Four distinct courses, two each from the lists below:

|  |  |
| --- | --- |
| Dynamic Meteorology | Physical Meteorology |
| METEO 520 (3) Geophysical Fluid Dynamics | METEO 532 (3) Chemistry of the Atmosphere |
| METEO 521 (3) Dynamic Meteorology | METEO 533 (3) Cloud Physics |
| METEO 551 (3) Physical Oceanography | METEO 535 (3) Radiative Transfer |
| METEO 554 (3) Atmospheric Turbulence | METEO 556 (3) Boundary Layer Meteorology |
| METEO 570 (3) Climate Dynamics | METEO 570 (3) Climate Dynamics |

***Thesis option:***  
METEO 880 (Communication of Meteorological Research) (2 credits)

METEO 600 (Thesis Research) (6 credits)  
MASTERS THESIS DEFENSE - PUBLIC PRESENTATION  
MASTERS THESIS (At least three signatures, including adviser and Head/Associate Head for the

Graduate Program)

***Paper option:***  
METEO or Related Discipline 400- or 500-level course electives (6 credits)  
METEO 596 (Paper Research) (2 credits; scholarly paper option)

MASTERS RESEARCH PAPER PRESENTATION - PUBLIC PRESENTATION  
MASTERS RESEARCH PAPER (At least three signatures, including adviser and Head/Associate

Head for the Graduate Program)

A suggestion for typical course sequencings for the different options is given in Table 4. The sequencing may be adjusted for individual students in consultation with the adviser.

Table 4. Typical course sequences for M.S. students in Meteorology and Atmospheric Science

**1st Year, Non-Meteorology Bachelors Degree**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **FALL Semester** | | | **SPRING Semester** | | |
| 3 | METEO 431 | Atmospheric Thermodynamics | 3 | METEO 5xx | Dynamic Met Core Class |
| 3 | METEO 421 | Atmospheric Dynamics | 3 | METEO 5xx | Physical Met Core Class |
| 3 | METEO 5xx | Any Elective | 3 | METEO 5xx | Any Elective |
| 1 | METEO 591 | Development and Ethics in the Atmospheric Sciences | 2 | METEO 600 | Thesis Research |
| 1 | METEO 590 | Colloquium | 1 | METEO 590 | Colloquium |
| 1 | METEO 600 | Thesis Research - Not Graded |  |  |  |

**1st Year, Meteorology Bachelors Degree**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **FALL Semester** | | | **SPRING Semester** | | |
| 3 | METEO 5xx | Dynamic Met Core Class | 3 | METEO 5xx | Dynamic Met Core Class |
| 3 | METEO 5xx | Physical Met Core Class | 3 | METEO 5xx | Physical Met Core Class |
| 3 | METEO 5xx | Any Elective | 3 | METEO 5xx | Any Elective |
| 1 | METEO 591 | Development and Ethics in Atmospheric Science | 1 | METEO 590 | Colloquium |
| 1 | METEO 590 | Colloquium | 2 | METEO 600 | Thesis Research |
| 1 | METEO 600 | Thesis Research |  |  |  |

# 2nd Year, Thesis Option

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **FALL Semester** | | | | **SPRING Semester** | | |
| 3 | METEO 4/5xx | Any 400- or 500-Level METEO&\* | | 1 | METEO 590 | Colloquium |
| 3 | METEO 4/5xx | | Any 400 or 500 Level Meteo&\* | 10 | METEO 600 | Thesis Research |
| 1 | METEO 590 | | Colloquium | 1 | METEO 592 | Research Proposal (optional) |
| 3 | METEO 600 | | Thesis Research |  |  | Prep in the Atm Sciences |
| 2 | METEO 880 | | Comm. Met. Research |  |  |  |

# 2nd Year, Paper Option

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **FALL Semester** | | | **SPRING Semester** | | |
| 3 | METEO 4/5xx | Any 400 or 500 Level Meteo&\* | 3 | METEO 4/5xx | Any 400 or 500 Level Meteo\* |
| 3 | METEO 4/5xx | Any 400 or 500 Level Meteo&\* | 3 | METEO 4/5xx | Any 400 or 500 Level Meteo\* |
| 1 | METEO 590 | Colloquium | 1 | METEO 590 | Colloquium |
| 3 | METEO 596 | Ind. Study – Not Graded | 6 | METEO 596 | Ind. Study – Not Graded |
| 2 | METEO 880 | Comm. Met. Research |  |  |  |

& METEO or related discipline

\* Two of these courses must be 500-level, and a total of six 3-credit METEO 5xx courses are required.

**Registration requirements**. M.S. students holding assistantships register for 12 credits in both the fall and spring semesters. Normally, M.S. students having departmental financial support do not register in the summer but are paid a summer assistantship. Occasionally some elective courses may be offered during the summer session, and so students should consult their advisers to see if they should register. M.S. students are not required to be registered in the semester they *defend* their theses/paper or in order to make minor revisions to their theses/papers.

**3.2 Thesis and Thesis Research**

The thesis, normally less than 100 pages in length, is written on a topic approved by the student's adviser. This thesis is read by the student’s committee, and it is approved by the Associate Head of the Graduate Program. By writing an acceptable M.S. thesis, students demonstrate that they are capable of completing a well-defined, directed study of a limited problem and are capable of writing a relatively brief, coherent report summarizing the major objectives and results of the study.

Because the entire Masters program should take only two years to complete, it is paramount that a student begins work on the thesis research as soon as possible, but certainly before the end of the first year of study. In the first semester of residence, it is the responsibility of each student to determine which of the faculty members might be willing to serve as a thesis adviser. The student’s committee is an important resource to help the student find a research topic. Students should not expect the faculty to come looking for them.

The thesis must be written according to the formatting and style guidelines discussed in the [Thesis Guide](http://www.gradsch.psu.edu/current/thesis.html) that is available from the Graduate School. There are three thesis submission deadlines that must be met:

1. Intent to Graduate (typically very early in the semester, done on [LionPATH](https://lionpathsupport.psu.edu/))
2. Thesis format review (typically within about 6 weeks after the semester start)
3. Submission of signed, archival copy of the thesis (typically 1 month before graduation)

Students who do not meet these deadlines will be removed from the graduation list by the Graduate School. It is incumbent on any student who has missed a deadline to get in touch with the Graduate Program Assistant, in the Meteorology and Atmospheric Science Department, Main Office, 501A Walker Building.

To help students prepare their theses, the Graduate Communication Enhancement Program ([Graduate Writing Center](http://gwc.psu.edu/)) schedules a number of workshops for M.S. and Ph.D. students. Topics of these workshops include: 1) Editing Your Writing for Grammar and Style, 2) Basic Principles of Technical Writing in English, and 3) Developing Your Written Expression in English.

The English Department offers a course for thesis writing: ENGL 511 – Thesis Workshop and Professional Writing. ENGL 511 is designed for graduate students who are native speakers of English and who are writing or will soon begin to write their dissertations and theses. The course focuses on principles of effective writing, including discipline-specific forms of argument, standards of evidence, and documentation, as well as general principles of presentation and style.

The thesis must be approved and signed by the adviser, at least one other committee member who is a member of the Graduate Faculty, and the Department Associate Head for the Graduate Program; only one of the Graduate Faculty members, the thesis adviser, need be in the Department of Meteorology and Atmospheric Science. In special circumstances, approved in advance by the Associate Dean of the Graduate School upon request of the Department Head, the second reader need not be a Graduate Faculty member. Additional readers who are not members of the Graduate Faculty may read and sign the thesis. Such people will be listed as special signatories on the signature page on the thesis. These people may not be used as substitutes for the above three required Graduate Faculty readers.

**3.3 Paper Option**

The paper, normally less than 20 pages in length, is written on a topic approved by the student's adviser and read by the student’s three-person departmental committee that is composed of the adviser and at least one other member of the Graduate Faculty of the university. The topic need not be original and may be a review of the literature on a particular topic or it may be a suitably extended term paper from a graduate meteorology course. The paper should have a title page and signatory page that has the same form as that signed for an M.S. thesis. The Graduate School does not review the paper. The final, corrected Masters paper must be submitted to the department -- not the Graduate School -- in electronic format by the same deadline as that for the final version of a thesis. Students must register for 2 credits of METEO 596 under their adviser in the semester they write the paper.

**3.4 Defense**

All M.S. students defend their research in a 30- to 50-minute seminar that is normally given one to two weeks prior to the final submission of the thesis or paper. The penultimate thesis or paper draft must be distributed to the student’s committee early enough that the committee has time to read the thesis or paper before the seminar is given (allow 1 work day per 10 pages). During the seminar, the audience should limit questions to points of clarification only; after the seminar, there will be ample time for a public discussion of the work. After that public session, the committee may discuss the thesis or paper further with the student. This private session is normally the time that feedback is provided and that the revisions required by the committee are discussed before the student may submit the final thesis or paper draft to the Thesis Office or the department as appropriate.

**3.5 Integrated B.S./M.S. Program in Meteorology (IUG)**

The Department of Meteorology and Atmospheric Science offers an integrated B.S./M.S. program, also called the Integrated Undergraduate-Graduate (IUG) program, that is designed to allow academically superior students to obtain both the B.S. and the M.S. degree in Meteorology and Atmospheric Science in five years of study. In order to complete the program in five years, students interested in the IUG program in Meteorology and Atmospheric Science must apply for admission to the Graduate School and the IUG program no later than the end of the second week of the semester preceding the semester of expected conferral of the undergraduate degree.

During the first three years, the student will follow the course scheduling of one of the options in the B.S. degree, normally the Atmospheric Sciences or the General Option (see the *Undergraduate Bulletin*). Students who intend to enter the IUG program are encouraged to take upper level classes during their first three years whenever appropriate. However, students must sequence their courses so all undergraduate degree requirements are fulfilled before taking courses to count solely towards the graduate degree. By the end of the junior year, students normally apply for admission to both the IUG Program and to the Graduate School. Acceptance decisions will be made prior to the beginning of the senior year and M.S. advising committees appointed for successful applicants. During the senior year, IUG students follow the scheduling of the selected B.S. Meteorology and Atmospheric Science Option, with an emphasis on completing 500-level course work as appropriate. At the same time, IUG students will start work on their theses or papers that are designed to meet the requirements of the M.S. degree in Meteorology and Atmospheric Science. During the fifth year, IUG students take courses fulfilling the departmental M.S. degree requirements and complete their M.S. theses. Typical scheduling plans for students pursuing the General or Atmospheric Sciences Options are given on the departmental website. If a plan similar to one of these plans is followed, then the student will have completed all requirements for the B.S. in Meteorology and Atmospheric Science by the end of the fourth year. If a student cannot continue in the integrated program, then this student will be able to receive the undergraduate degree upon completion of all of the B.S. requirements.

**Section 4. Degree Requirements - Ph.D.**

**4.1 Summary of Degree Requirements**

Requirements listed here are in addition to requirements stated in the [DEGREE REQUIREMENTS](https://bulletins.psu.edu/graduate/programs/majors/meteorology-atmospheric-science/#degreerequirementstext) section of the Graduate Bulletin.

Studies for the Ph.D. degree are designed to accommodate the interests and capabilities of the candidate, and they are overseen by a doctoral committee, which also administers comprehensive and final oral examinations. Before being admitted to Ph.D. candidacy, a student must have the academic support of a faculty member and the student must pass the Ph.D. Qualifying Examination. The exam must be taken within three semesters (excluding summer sessions) of entry into the doctoral program. If a student does not pass the exam on their first attempt, then a second attempt may be allowed at the discretion of the graduate faculty members of the Department.

In addition, Ph.D. degree requirements include successful completion of the following: approved graduate course work, English Competence requirements, a comprehensive examination, and a final oral examination (the dissertation defense). The student must pass the English competency exam before scheduling the comprehensive exam. To earn the Ph.D. degree, doctoral candidates must write a dissertation that is accepted by the doctoral committee, the head of the graduate program, and the Graduate School. For the Ph.D. program, a minimum of 21 credits is required, including a core curriculum of 12 credits in four distinct courses, two each from two prescribed lists for dynamic meteorology and physical meteorology. The dynamic meteorology list consists of METEO 520 (3 credits), METEO 521 (3 credits), METEO 554 (3 credits), METEO 551 (3 credits), and METEO 570 (3 credits). The physical meteorology list consists of METEO 532 (3 credits), METEO 533 (3 credits), METEO 535 (3 credits), METEO 556 (3 credits), and METEO 570 (3 credits). In addition, a student must take METEO 591 (1 credit) the first semester it is available upon matriculating in the program. METEO 880 (2 credits) must be taken prior to the department's competency exam in written and spoken technical English.

Most students complete all the course requirements for an M.S. degree prior to entering Ph.D. candidacy. The 12 credits of core curriculum courses, METEO 880, and METEO 591 may be waived as required courses at the discretion of the program if the student has already taken them or equivalent courses, and the total required credits will be reduced accordingly. A minimum of 6 elective credits from METEO 500-level or related discipline 400- or 500-level courses must be taken that do not count toward any other degree requirement and finished by the semester in which the comprehensive exam is passed. In addition to the 21 minimum required credits, one credit of METEO 590 is required each semester until the comprehensive exam is passed. A student must pass the department's competency exam in written and spoken technical English before being admitted to the comprehensive exam. There are no minimum quality-graded credit (research credits whose grades count toward the grade-point average) requirements for METEO 600; students may earn up to a maximum of 12 quality-graded METEO 600 credits.

**Dissertation.** Students will complete a dissertation, normally less than 200 pages in length, on an original topic that is approved by the student's adviser and Ph.D. committee, read by the committee, and approved by the Associate Head of the Graduate Program. By writing an acceptable Ph.D. dissertation, students demonstrate that they are capable of completing a well-defined, self-directed study of a new problem and are capable of writing a relatively brief, coherent report summarizing the major objectives and results of the study. The dissertation work must be of publishable quality.

**Registration requirements.** All on-campus students must register continuously in the fall and spring semesters up to and including the semester or session in which the Final Oral Exam is passed. Summer session registration is not required unless a student is taking a Comprehensive or Final Oral Exam in that session. Active off-campus students who have passed their Qualifying Exam and who have satisfied the two-semester full-time residence requirement need only register each fall and spring semester.

After passing the Comprehensive Exam, a student will normally register in the fall and spring for the noncredit course METEO 601 (Thesis Preparation, full-time) or METEO 611 (Thesis preparation, part-time). If a student registers for METEO 601 or 611, then each semester this student may still register for one three-credit course for a nominal charge or may audit one three-credit course for no charge.

If a Ph.D. student will not be in residence for an extended period for compelling reasons, then the Senior Associate Dean of the Graduate School will consider a petition for a waiver of the continuous registration requirement. This petition must come from the doctoral committee chairperson and must carry the endorsement of the Department Head or the Associate Head of the Graduate Program.

**Residency requirement.** The University residency requirement is that each student must spend at least two consecutive semesters, exclusive of summer sessions, as a registered full-time student engaged in academic work at the University Park Campus. The residency requirement can be completed at any time after a student has been admitted to the Ph.D. program.

**Degree completion requirement.** The Ph.D. degree must be completed within eight years of admission to candidacy (i.e., passing the Qualifying Exam) and within six years of passing of the Comprehensive Exam.

**4.2 Composition of Doctoral Committees**

A student’s Dissertation Committee shall be nominated to the Graduate School by the student’s major Graduate Program Head as soon as possible after passing the Ph.D. Qualifying Exam. A student’s Dissertation Committee shall consist at minimum of four members of the Graduate Faculty, each of whom shall be in a position to contribute substantially to the student’s education (<http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/gcac-602-phd-committee-formation/>). At least two Committee members shall be from the student’s major graduate program (i.e., Meteorology and Atmospheric Science). At least one Committee member must be a Graduate Faculty member from outside of the Department of Meteorology and Atmospheric Science. Dissertation Committees may also include other participants who are not members of the Graduate Faculty but are otherwise qualified and have particular expertise in the student’s research area.

For students pursuing a graduate minor, the Dissertation Committee shall include a Minor Field Member representing each graduate minor. For students pursuing dual-title degrees, either the Dissertation Committee Chair or a co-Chair must be a Graduate Faculty member of the dual-title program.

The Graduate Program Head can consult with the student and the student’s adviser on the composition for the committee. The Graduate Program Head is also responsible for nominating non-PSU members of the Dissertation Committee to the Graduate School, and ensuring appropriate Dissertation Committee composition that is in the best interests of the student and the completion of their dissertation.

The Dissertation Committee shall meet with the student no less than annually to assess student progress toward the degree.

**4.3 Qualifying Exam**

The main purpose of the Qualifying Exam is to evaluate the potential for students to conduct independent, Ph.D.-level research and communicate their research in written and oral form. The ability to master core subject matter in atmospheric science is also a prerequisite for candidacy. In the words of the Graduate Council (GCAC-604), “The primary purpose of the Qualifying Examination is to provide an early assessment of whether the student has the potential to develop the knowledge, skills, and attributes the program has defined in its formal Learning Objectives, including evidence of critical thinking skills, necessary for a successful researcher in the disciplinary field.” The Qualifying Examination should be taken within three semesters of joining our Ph.D. program.

The Qualifying Exam consists of four elements, all of which are considered by the Graduate Academic Program committee (GAP), which makes recommendations to the full Graduate Faculty. Final decisions are made by the full Graduate Faculty. No single element of the exam guarantees success or failure. Each student’s case is considered individually by both GAP and the full Graduate Faculty.

Elements of the Qualifying Exam include the following:

1. **Core Courses.** Performance in core and elective courses as evidenced by grades from core course instructors. A student must declare a core (four distinct courses, two each selected from two prescribed lists for dynamic meteorology and physical meteorology). The core may be declared after completion of the classes. A core GPA of 3.5 or higher is required for Ph.D. candidates. Students with a cumulative GPA in their selected core courses less than 3.5 must have a plan for remedial actions agreed upon with GAP in advance of their research presentation. These remedial actions are intended to address the lack of mastery of core course materials. The GAP committee will dictate allowable remedial options which could include: 1) retaking a final exam from core courses to bring their "core competency" GPA up to 3.5 or above (no transcripts would be changed, but an “A” performance on the course exam would be considered as an “A” level understanding for that course for the purposes of the qualifying exam), or 2) high-level performance in a related graduate course that is substituted for a core course with GAP approval. The time allowed for these remedial actions is dictated by Graduate School regulations concerning qualifying exams. The student is allowed two attempts to improve each course grade. One or more of the core course instructors will write an exam if that remedial approach is requested. Grading will be distributed across the faculty with appropriate expertise, with two faculty members grading each question. The student and adviser must petition GAP prior to scheduling the research exam in order to put approved remedial activities in place. The remedial actions do not have to be completed in advance of the research exam. GAP will provide an amendment to the “core course” portion of the qualifying exam assessing the student’s performance in the remedial studies. Students from M.S. programs outside of Penn State Meteorology and Atmospheric Science must present evidence of Penn State meteorology core course material. This may be accomplished by taking to core material at Penn State, or by petitioning GAP to have equivalent courses from their M.S. programs and the associated grades accepted as credit towards their core course expertise. GAP will translate grading systems that do not use a 4.0 scale on a case-by-case basis.
2. **Adviser Evaluation.** A written evaluation of progress to date from the student's research adviser. The adviser will present this evaluation in person to GAP and answer any additional questions posed by GAP. The adviser's evaluation is to focus on the quality and quantity of research accomplishment, and must also include a discussion of how much of the research was done independently.
3. **Written Report and Oral Presentation.** A written report and oral presentation of the student's research progress to date. The report is to be written in the style of a journal article. The paper is limited to a maximum of 4000 words and a total of eight figures or tables. The word count does not include figure or table captions or references. If the student completes a Master's thesis in the Department of Meteorology and Atmospheric Science, the Master's research can serve as the basis for this document. If the student has completed a Master's thesis elsewhere, either this thesis or research conducted while a graduate student in Penn State's Meteorology graduate program can provide the basis for this written research report. If the student is not pursuing a Master's degree at Penn State and has not completed a Master's thesis elsewhere, their research progress to date will serve as the basis for this research report. Regardless of the nature of the research report, the overwhelming majority of its content should be written by the student, and the totality should be understood by the student. Contributions by the adviser and other collaborators are allowed, but these contributions should be modest. For example, if the research report is based on a manuscript submitted to a journal, the adviser and other co-authors can be involved in editing the writing, commenting on the content, or both. This research report shall be submitted to the Qualifying Exam Evaluation Committee at least two weeks in advance of the oral presentation of research, along with a brief statement written by the student and approved by the adviser that articulates the contributions of the adviser and other collaborators. The oral presentation shall be open to the public (including the student’s adviser). The oral presentation should be approximately 30 minutes in length and may be followed by questions from the general audience.
4. **Oral Examination.** An oral examination immediately following the research presentation. The oral examination will be closed, and will be administered by the Qualifying Exam Evaluation Committee. The adviser is not allowed to attend the closed session of the exam. Questions from the evaluation committee can be related to both the student’s understanding of their research work and to the fundamentals of atmospheric science related to the research. The focus of the oral exam is on the student's research understanding and ability. The oral exam is not intended to serve as an evaluation of the student’s mastery of core course content. In the case of a student who is completing a Master's thesis in the Department of Meteorology and Atmospheric Science, this presentation will be distinct from the thesis defense, and can occur before or after the thesis defense**.**

Each member of the evaluation committee will submit two evaluations and optional written comments to GAP. One evaluation will be of the student's written report and oral presentation of the research (item 3 above) and the other evaluation will be of student’s performance on the oral exam (item 4 above) to GAP. GAP will submit a recommendation to the full faculty, and a written evaluation to be provided to the student. A summary evaluation of "pass," "option to retake," or "no option to retake" must be given. This evaluation, as amended and passed by the full faculty, will be presented to the adviser and student. If the student does not pass but is given the option to retake, the faculty can suggest that some or all elements of the exam need to be repeated, but second evaluations will be based on all of the elements of the exam as described above. The exam can be repeated once. The student's adviser must support the student's attempt to retake the exam. The retake must be attempted within six months of the first exam. Extensions can be requested in cases of extenuating circumstances.

Qualifying Exam Evaluation Committee membership, GAP membership, and exam scheduling:

1. The Qualifying Exam Evaluation Committee consists of four members of the Graduate Faculty representing broad expertise from within the Department. The standing committee will invite one “expert” member to each committee (not the adviser) who has some disciplinary expertise in the area of the paper. The expert helps to interpret the paper content. The questions should remain at a fundamental level and should not delve deeply into the disciplinary details of the research (in contrast to a comprehensive exam). The expert will be joined by two members of the standing evaluation committee, so that three committee members participate in each exam. This committee will administer the written and oral research exam to all students taking the exam during a given academic year. The student's adviser will not be a member of the committee. Membership on the evaluation committee will rotate, with some continuity to aid in maintaining consistency in the evaluation standards over time. A term on the exam committee will consist of eight to ten exams. The committee will coordinate with students to schedule these exams on a rolling basis.
2. GAP will meet approximately four times per year to evaluate Qualifying Exam assessments. The meeting dates will be publicized so that graduate students can plan their research presentations appropriately. If a student's adviser is a member of GAP, the adviser will recuse him or herself from the discussion of their student. GAP decisions will be made by majority vote. GAP's recommendations will be passed on to the full graduate faculty for a final vote.

**4.4 Technical English Competency Exam**

All Ph.D. students in the Department of Meteorology and Atmospheric Science must show that they have mastered the organizational and writing skills necessary for them to produce short written and oral papers on focused technical subjects. Thus, all Ph.D. candidates are required to pass an examination designed to test their competency in the use of both written and spoken English for communicating technical subject matter. This examination has two components:

1. the writing of a polished short research paper in the format of a peer-reviewed journal article. The paper written in METEO 880 may be used, so long as the main body of the text (typically the introduction to the conclusions) is 2000 words or less. Title page, abstract, acknowledgements, references, and captions for figures and tables are not included in the word limit.
2. the delivery of a timed 12-minute talk as if it were being presented at a conference; the talk presented in METEO 880 may be used.

METEO 880 is the preparatory course for the Technical English Competency Exam with speaking and writing requirements matching that for this exam. The final draft of the paper written in METEO 880 is will serve as the Technical English Competency Exam paper. As part of the class, students are given feedback on earlier drafts of the paper by fellow students and the instructor. Faculty input is allowed on this exam paper so long as the sentences are critiqued but not rewritten by the faculty; the intent is for the students' writing ability to be evaluated, which cannot be done if the faculty rewrites the paper as part of the input phase. Thus, a paper submitted as part of the exam is to be single-authored by the student.

In METEO 880 and the exam, students give a rigorously timed 12-minute talk. As part of the course, students are provided lots of detailed feedback on their METEO 880 talks. Also, students are counseled in the course to practice all of their talks with an audience to get helpful input. Given that many students have little or no technical speaking experience, having faculty and others provide feedback on student talks to help them improve their speaking ability is allowed.

Competence in technical speaking and writing is certified by an ad hoc panel of meteorology faculty members, none of whom may be the student's adviser. Evaluation criteria for both components are

1. The short paper will be written on a subject approved by both the instructor of METEO 880 and the student's adviser. The organization, content, figure clarity, word usage, grammar, punctuation, and layout of the paper will all be judged equally by the faculty evaluators.
2. In the oral presentation portion of the exam, students must show that they know how much material can be communicated effectively in a 12-minute talk and that they can deliver this talk coherently using legible, uncluttered slides.

The examination is offered in the last week of classes in the Fall semesters to coincide with the METEO 880 oral presentations, though the exam can be taken at other times during the year if approval is granted by the graduate program head and adviser.

**4.5 Comprehensive Exam**

The Comprehensive Exam consists of a written component and an oral component. The written component consists of a written prospectus and a written exam. Students are strongly encouraged to take the Comprehensive Exam within 12 months of passing the Qualifying Exam.

A dissertation prospectus is a document that provides a road map for the proposed dissertation. The student must write a prospectus describing a plan for future research, which should include an introduction that motivates the research by noting gaps of knowledge in the field, key research questions to be addressed, a brief summary of proposed methodology, a summary of work completed to date, and a schedule of milestones. There is no strict word or page limit, although a guideline of approximately 8000 words (roughly a 15-page document) is noted. The prospectus should be sent to the committee at least two weeks prior to the written exam date.

The written exam primarily covers material related to the proposed dissertation topic, and it is written and evaluated by the Ph.D. Committee members. Each committee member prepares a “question,” which can be multi-part, for the student, indicating what resources may be used to answer the question (e.g. books, notes, electronic resources, internet, etc.). The general target is 1–2 hours per question, and the total length for the written exam should not exceed 8 hours. Questions are submitted to the advisor, who prepares the final set of questions and administers the exam to the student one to two weeks prior to the oral exam. Question responses are then shared back to the committee before the oral exam.

The oral component begins with a public research presentation by the student (30–40 minutes in length) that covers aspects of the proposed dissertation work including research they have done and research they intend to pursue. The public presentation is followed by a short public Q&A session.

The committee asks the student to step out of the room and confers briefly to plan the closed session. The student is then invited back into the room, and is asked questions from the committee members in a closed session lasting from 45–120 minutes. The student then leaves the room, and the committee discusses the student’s performance (on both the oral and written components) and votes. At least 2/3 of the committee must vote in favor of passing the student for the student to have passed the exam. The student is then informed of the outcome of the vote.

**4.6 Thesis and Final Oral Exam**

All Ph.D. candidates must write a dissertation. The topic of the study must be original and must be developed in large part by the student. At typical dissertation is 100 to 200 pages in length and should be completed within two years after a student has passed the Ph.D. Comprehensive Exam.

The dissertation must be written according to the formatting and style guidelines discussed in the [Thesis Guide](http://gradschool.psu.edu/current-students/etd/) that is available from the Graduate School. There are three thesis submission deadlines that must be met:

1. Intent to Graduate (typically very early in the semester, done on e-lion)
2. Thesis format review (typically within about 6 weeks after the semester start)
3. Submission of signed, archival copy of the thesis (typically 1 month before graduation)

Students who do not meet these deadlines will be removed from the graduation list by the Graduate School. It is incumbent on any student who has missed a deadline to get in touch with the Graduate Program Assistant, Department of Meteorology and Atmospheric Science, Main Office, 501A Walker Building.

Once completed in manuscript form, the dissertation is given to the student's Ph.D. Committee whose members read it and then administers a Final Oral Exam, or thesis defense. The committee members must have copies of the completed dissertation at least two weeks prior to the scheduled defense date. Once the Final Oral Exam is scheduled with the committee, the student must inform the Graduate Staff Assistant. The Graduate Staff Assistant then will notify the Graduate School, at least two weeks prior to the exam, in the same way that the Comprehensive Exam was scheduled.

There must be at least three months between the Comprehensive and Final Oral Exams. All Final Oral Exams begin as special departmental seminars that are open to all available faculty and graduate students of the department. This seminar is a formal, scholarly one and should be conducted as would be a seminar for a job interview. Typically, this seminar is scheduled first and then the student's committee and other interested faculty meet with the student after the seminar to ask any additional questions. This committee then decides whether a student passes the exam; as for the Comprehensive Exam, at least 2/3 of the committee must vote in favor of passing the student for the student to have passed the exam.

**4.7 Dual-Title Ph.D. in** [**Climate Science**](http://bulletins.psu.edu/graduate/programs/C/GRAD%20CLSCI)

Students interested in the field of Climate Science may wish to obtain a Dual-Title Doctoral Degree in Climate Science and Meteorology and Atmospheric Science. The pursuit of this dual title entails additional course work beyond the degree requirements set forth here (see the Graduate Bulletin, [Climate Science,](http://bulletins.psu.edu/graduate/programs/C/GRAD%20CLSCI) for further details concerning these course and other program requirements), as well as the participation of at least one Climate Science program faculty member on the dissertation committee. The Climate Science representative, who assists with the selection of courses, may be the adviser and have an appointment in Meteorology and Atmospheric Science. The Ph.D. qualifying exam for dual-title students will be administered by Meteorology and Atmospheric Science but with a component of it from the Climate Science representative, that assesses their potential in the field of Climate Science. The field of Climate Science will also be integrated into the comprehensive examination. A Ph.D. dissertation that contributes fundamentally to the field of Climate Science is required. A public oral presentation of the dissertation is required.

**Admissions Requirements.**  Students must apply and be admitted to the graduate program in Meteorology and Atmospheric Science and The Graduate School before they can apply for admission to the dual-title degree program. After admission to their primary program, students must apply for admission to and meet the admissions requirements of the Climate Science dual-title program. Refer to the [Admission Requirements](http://bulletins.psu.edu/graduate/programs/C/GRAD%20CLSCI) section of the Climate Science Bulletin page. Doctoral students must be admitted into the dual-title degree program in Climate Science prior to taking the Qualifying Examination in their primary graduate program.

**Degree Requirements.** To qualify for the dual-title degree, students must satisfy the degree requirements for the Ph.D. in Meteorology and Atmospheric Science, listed above. In addition, students must complete the degree requirements for the dual-title in Climate Science, listed on the [Climate Science Bulletin page.](http://bulletins.psu.edu/graduate/programs/C/GRAD%20CLSCI)

The Qualifying Examination committee for the dual-title Ph.D. degree will be composed of Graduate Faculty from Meteorology and Atmospheric Science and must include at least one Graduate Faculty member from the Climate Science program. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. There will be a single Qualifying Examination, containing elements of both Meteorology and Atmospheric Science and Climate Science. Dual-title graduate degree students may require an additional semester to fulfill requirements for both areas of study and, therefore, the Qualifying Examination may be delayed one semester beyond the normal period allowable.

In addition to the general Graduate Council requirements for doctoral committees, the doctoral committee of a Meteorology and Atmospheric Science and Climate Science dual-title Ph.D. student must include at least one member of the Climate Science Graduate Faculty. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. If the chair of the doctoral committee is not also a member of the Graduate Faculty in Climate Science, the member of the committee representing Climate Science must be appointed as co-chair. The Climate Science representative on the student’s doctoral committee will develop questions for and participate in the evaluation of the comprehensive examination.

Students in the dual-title program are required to write and orally defend a dissertation on a topic that is approved in advance by their doctoral committee and reflects their original research and education in Meteorology and Atmospheric Science and Climate Science. Upon completion of the doctoral dissertation, the candidate must pass a final oral examination (the dissertation defense) to earn the Ph.D. degree. The dissertation must be accepted by the doctoral committee, the head of the graduate program, and the Graduate School.

**4.8 Dual-Title Ph.D. in** [**Astrobiology**](http://bulletins.psu.edu/graduate/programs/A/GRAD%20ABIOL)

Students interested in the emerging field of Astrobiology may wish to obtain a Dual-Title Graduate Degree in Astrobiology and Meteorology and Atmospheric Science. The pursuit of this dual title entails additional course work beyond the degree requirements set forth here (see the Graduate Bulletin, [Astrobiology](http://bulletins.psu.edu/graduate/programs/A/GRAD%20ABIOL), for further details concerning these course and other program requirements), as well as the participation of at least one Astrobiology program faculty member on the dissertation committee. The Astrobiology representative, who assists with the selection of courses, may be the adviser and have an appointment in Meteorology and Atmospheric Science. The Ph.D. qualifying exam for dual-title students will be administered by Meteorology and Atmospheric Science but with a component of it from the Astrobiology representative, or others related to this dual-title graduate degree, that assesses their potential in the field of Astrobiology. The field of Astrobiology will also be integrated into the comprehensive examination. A Ph.D. dissertation that contributes fundamentally to the field of Astrobiology is required. A public oral presentation of the dissertation is required.

**Admissions Requirements.** Students must apply and be admitted to the graduate program in Meteorology and Atmospheric Science and The Graduate School before they can apply for admission to the dual-title degree program. After admission to their primary program, students must apply for admission to and meet the admissions requirements of the Astrobiology dual-title program. Refer to the Admission Requirements section of the Astrobiology Bulletin page. Doctoral students must be admitted into the dual-title degree program in Astrobiology prior to taking the Qualifying Examination in their primary graduate program.

**Degree Requirements.** To qualify for the dual-title degree, students must satisfy the degree requirements for the Ph.D. in Meteorology and Atmospheric Science, listed above. In addition, students must complete the degree requirements for the dual-title in Astrobiology, listed on the [Astrobiology](http://bulletins.psu.edu/graduate/programs/A/GRAD%20ABIOL) Bulletin page.

The Qualifying Examination committee for the dual-title Ph.D. degree will be composed of Graduate Faculty from Meteorology and Atmospheric Science and must include at least one Graduate Faculty member from the Astrobiology program. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. There will be a single Qualifying Examination, containing elements of both Meteorology and Atmospheric Science and Astrobiology. Dual-title graduate degree students may require an additional semester to fulfill requirements for both areas of study and, therefore, the Qualifying Examination may be delayed one semester beyond the normal period allowable.

In addition to the general Graduate Council requirements for doctoral committees, the doctoral committee of a Meteorology and Atmospheric Science and Astrobiology dual-title Ph.D. student must include at least one member of the Astrobiology Graduate Faculty. Faculty members who hold appointments in both programs’ Graduate Faculty may serve in a combined role. If the chair of the doctoral committee is not also a member of the Graduate Faculty in Astrobiology, the member of the committee representing Astrobiology must be appointed as co-chair. The Astrobiology representative on the student’s doctoral committee will develop questions for and participate in the evaluation of the comprehensive examination.

Students in the dual-title program are required to write and orally defend a dissertation on a topic that is approved in advance by their doctoral committee and reflects their original research and education in Meteorology and Atmospheric Science and Astrobiology. Upon completion of the doctoral dissertation, the candidate must pass a final oral examination (the dissertation defense) to earn the Ph.D. degree. The dissertation must be accepted by the doctoral committee, the head of the graduate program, and the Graduate School.

**4.9 International Graduate Students**

International students on teaching assistantships must take the American English Oral Communicative Proficiency Test (AEOCPT) before the commencement of classes. Typically, this test is administered during the orientation program for incoming international students.

International students must complete their program of study (M.S. or Ph.D.) by the date issued on their I-20s. If they are unable to do so, then they must seek an extension on their I-20s by contacting the University Office of Global Programs (UOGP) in Boucke Building (4th floor). In addition to the above constraint, the Department of Meteorology and Atmospheric Science has additional deadlines. Students who graduated from Penn State with M.S. degrees in meteorology are given four years to complete their Ph.D. from the time they completed their M.S. degrees. Students who graduated from Penn State with M.S. degrees from departments other than meteorology or who obtained M.S. degrees from different institutions have five years from the time they began their studies in the Department of Meteorology and Atmospheric Science at Penn State. Finally, students who do not have M.S. degrees have six years.

Normally, a student will no longer be allowed to continue graduate study if competency is not demonstrated on a second examination

**Section 5. Assistantships and Fellowships**

Most students in the department are supported through either fellowships or assistantships according to the needs of the department. In addition, with few exceptions, all of our students are appointed as research assistants for the summer semester. Applicants to the department are considered also for college and university fellowships; a student granted such a fellowship is free to pursue an intensive year of studies without any of the additional duties that are associated with an assistantship. Moreover, the department will assist existing students with their applications for fellowships available both internally and externally.

An assistantship appointment for each student is granted on a semester-by-semester basis after the first academic year. Normally, students who maintain regular academic status and who make adequate progress toward completing their degrees can expect continued support. Students who are receiving continued support each semester must sign a university Terms of Offer of a Graduate Assistantship form that is signed by the adviser (for research assistantships) or the Department Head or the Associate Head of the Graduate Program (for teaching assistantships). Also, the department via the student's adviser will inform the student in writing, after meeting with the student, if financial support is being terminated.

Students holding teaching assistantships and who are making satisfactory progress toward their degree will be appointed at Grade 12 each fall and spring semester. Students who hold teaching assistantships and who also have research advisers with adequate funds, however, may have their salaries incremented by their research advisers from a Grade 12 salary to the highest-grade level for which they qualify at that time.

The stipend level for each research assistantship normally is linked to the student's rate of progress, with increases in grade level normally granted after certain milestones are passed. It is the responsibility of each student to ensure that his or her adviser notifies the department office of any changes in status so that appropriate increases in stipend can occur. Milestones and associated grade levels for research assistantships are summarized below:

1) Completing 15 course credits (400-and 500-level) with an overall GPA of 3.0 or above or having an M.S. degree in meteorology or atmospheric science (Grade 13)  
2) Being admitted to Ph.D. Candidacy (Grade 14), and  
3) Passing the Ph.D. Comprehensive Exam (Grade 15).

Subject to the approval of the Department Head, assistantships during the fall and spring semesters may be supplemented up to 50% in circumstances that include:

1) The thesis adviser can demonstrate that the student is making exceptionally good progress toward finishing the degree, or  
2) The student has multiple duties, such as serving simultaneously as a teaching assistant and a research assistant. In the summer, students paid from research budgets are offered the equivalent of fall or spring semester assistantships. Graduate students normally do not register and are paid on a special summer graduate assistantship over the two months of June and July, although student obligations to their research advisers run from the end of spring semester through the beginning of the following fall semester. That is, summer appointments are for a three-month period, May 15-August 15, but are paid in two monthly lump sums*.* Summer internships through the Weather Communications Group, however, do not pay as much as summer research assistantships. As a result, the total summer salary may vary from one student to the next depending on the source and available level of funds. If a student is unable to secure summer funding, then he or she should see his or her adviser or the Associate Head for the Graduate Program early in the Spring Semester to discuss the available funding options. Overall, the overwhelming majority of M.S. and Ph.D. students obtain summer support through research assistantships with one or two students per year choosing an alternative funding route as a result of their career interests that leads to different levels of summer support.

A student remaining at a certain level for a period longer than noted in [Table 7](http://www.met.psu.edu/academics/graduate-studies/graduate-student-handbook-1/selected-forms/Table7.pdf/view?searchterm=Table%207) is considered to be making unsatisfactory progress toward the degree. In this case, the stipend for a student still having an assistantship automatically will be decreased one level below the standard levels noted above. The stipend will be similarly further decreased in each, if any, succeeding semester as well. A student subsequently passing the next milestone is given the appropriate stipend. A student and adviser together may petition the Department Head for an exception to this policy.

An assistantship may be terminated if the student blatantly disregards departmental or Graduate School rules, such as the one limiting credit loads per semester, or if the student's program is terminated for unsatisfactory scholarship.  
  
**5.1 Teaching Assistantships**

Teaching assistantships are available in the fall and spring semesters for new students who have adequate backgrounds in meteorology or in a related field, and for more senior meteorology graduate students, regardless of their undergraduate backgrounds. Students supported by teaching assistantships are involved with teaching of meteorology laboratory classes for non-majors, grading problems and exams for instructors, or helping with advanced meteorology laboratories. Senior graduate students sometimes teach undergraduate survey courses or physical meteorology labs, and all students are encouraged to do some teaching during their graduate study.

It is Earth and Mineral Science College policy that no graduate student for whom English is a second language may serve as a teaching assistant or may conduct laboratories until he or she has received an NR (No Restriction) rating from the Department of Linguistics. Students should contact the Graduate Staff in the Department of Meteorology and Atmospheric Science to schedule the Penn State [American English Oral Communicative Proficiency Test](http://aplng.la.psu.edu/programs/about-the-aeocpt/about-the-american-english-oral-communicative-test-aeocpt). Students who do not receive an NR rating may take some or all of the English as second language courses: ESL 115G, 117G, or 118G.

In most cases, a student holding a teaching assistantship that involves lecturing in a lab or a class should register for METEO 602, Supervised Experience in College Teaching. Before doing so, each TA should consult with either the TA supervisor, Bill Syrett or the Associate Head for the Graduate Program. Such a course, however, does not count toward the 34 credits required of M.S. students, although it does count toward the semester limit. In addition, this course may not be used to satisfy the full-time registration requirements of international students holding student visas. Finally, students may pursue a [Graduate School Teaching Certificate](http://gradschool.psu.edu/current-students/tacert/).

**5.2 Research Assistantships**

Research assistantships support students as they work on their thesis research. These assistantships, unlike teaching assistantships, are usually funded by outside sources such as the National Science Foundation, National Aeronautics and Space Administration, or Office of Naval Research, and so the number available will vary from year to year. The professor or professors who have obtained the funding from a particular agency for a given project supervise them. Consequently, the availability of funds for support of new students depends on the success the faculty has had in obtaining research grants. If adequate funds are available, then students who pass the milestones listed at the beginning of this section will receive increases in their stipends. Two years is considered to be the normal duration of a research assistantship for an M.S. student.

**5.3 Fellowships**

The Graduate School or the College of Earth and Mineral Sciences (EMS) awards a limited number of fellowships to scholastically outstanding students. Fellows may not accept employment during the periods of their appointments, nor are they required to render any service to the University. Fellows receive stipends that vary with the particular award and usually receive grants-in-aid for tuition. For incoming students, the graduate admission application serves as the fellowship application. The [University Fellowships Office](https://ufo.psu.edu/fellowships-search) maintains a searchable compilation of available external fellowships.

Students granted fellowships should carry the same credit loads as those holding regular assistantships except in the summer. Full-time graduate fellows are also required to have medical insurance. Normally and if funds are available, students who are making satisfactory progress will be awarded assistantships once their fellowships expire.

**5.4 Tax Withholding**

All students on assistantships must file a W-4 form with the Payroll Office at the time their assistantships begin. Current withholding information is printed on both the check stub and the remittance advice for direct deposit. Students having questions may contact the Payroll Office in 101 James M. Elliot Building, at (814) 865-7621, or may send e-mail to [payroll@psu.edu](mailto:payroll@psu.edu). W-4's are available from the Payroll Office, the Payroll window at the Office of the Bursar, and the department office, or they may be printed from the web <https://controller.psu.edu/payroll-office/forms>

**When students fall below half-time student status**, i.e., in the summer when not taking classes, they are no longer exempt from Social Security and Medicare (FICA) taxes. When budgeting, students should plan accordingly.

**When a student leaves Penn State**, that student must file a new W-4 form so that Penn State has an address on file to send the W-2 for the current tax year. When filling out a new W-4 form, it is important that the student completes the entire form. Whatever information is supplied on this form will replace the current information on file, including blanks. The IRS requires that if the withholding information is left blank, then Penn State must withhold at the rate for "SINGLE" (this is the highest withholding rate) and cannot allow any withholding allowances.

**5.5 State and Local Taxes**

No state and local taxes are withheld for students on graduate research assistantships during the academic year, per University standards. All summer appointments are taxable, however.

**5.6 Tuition Grant-in-Aid**

The Graduate School Tuition Grant-in-Aid provides payment of a student's tuition. For the most part, assistantships and fellowships cover tuition as well as a monthly stipend. If tuition is not covered by funds, then graduate degree or certificate students (non-degree students are not eligible) may apply during or after their second semester at the University for a tuition grant-in-aid. Recipients are selected on the basis of demonstrated financial need. The Grant-in-Aid is intended primarily to provide temporary assistance, and will not be given for more than two semesters. Preference is given to applicants who have one semester of coursework remaining.

Application forms can be picked up at 314 Kern. The person in charge of the applicant’s graduate major must endorse each application. A copy of the applicant's Penn State transcript is required (unofficial transcripts are acceptable; grade slips are not acceptable).

**Section 6. Departmental Courses**

Meteorology and Atmospheric Science course descriptions can be found on [LionPath under “Meteorology"](https://www.lionpath.psu.edu/psp/CSPRD/EMPLOYEE/HRMS/c/SA_LEARNING_MANAGEMENT.SSS_BROWSE_CATLG.GBL?PORTALPARAM_PTCNAV=HC_SSS_BROWSE_CATLG_GBL2&EOPP.SCNode=HRMS&EOPP.SCPortal=EMPLOYEE&EOPP.SCName=CO_EMPLOYEE_SELF_SERVICE&EOPP.SCLabel=Self%20Service&EOPP.SCPTfname=CO_EMPLOYEE_SELF_SERVICE&FolderPath=PORTAL_ROOT_OBJECT.CO_EMPLOYEE_SELF_SERVICE.HC_SS_FAC_ADV_SRCH_GBL.HC_SSS_BROWSE_CATLG_GBL2&IsFolder=false).

**Section 7. Student Organizations**

There are a number of organizations in the Department, College, and University in which students are encouraged to participate. Several of these are discussed below. Also presented are summaries of elected positions that graduate students are expected to fill.

**7.1 Chi Epsilon Pi Honor Society**

[Chi Epsilon Pi](http://www.met.psu.edu/academics/undergraduate-studies/clubs-and-organizations/chi-epsilon-pi) is the national meteorology honor society founded in 1951 at the University of California at Los Angeles. Its members are graduate and undergraduate students, faculty, and staff, who are members for life.   
  
Graduate students are eligible for active student membership after:

(a) attaining an undergraduate degree in meteorology or atmospheric sciences with a cumulative grade-point average of 3.0 or higher in meteorology courses and of 3.1 or higher overall, on a 4.0 scale, or

(b) completing nine credits of 400- or 500-level meteorology courses while in graduate status and attaining a grade-point average of 3.5 or higher in meteorology, on a 4.0 scale, or

(c) completing 15 credits of 400- or 500-level coursework with an overall GPA of 3.00 or greater, or

(d) attaining an M.S. or Ph.D. in meteorology or atmospheric sciences, or

(e) passing the Ph.D. Qualifying Exam in meteorology.

Students who believe that they are eligible for membership should contact the faculty adviser.

Chi Epsilon Pi organizes the annual fall picnic, fall hike, map discussions, and spring department banquet. Initiation ceremonies are held in both the spring and the fall. Please see their website for more information**.**

**7.2 University Graduate Student Association (GSA)**

The mission of The Pennsylvania State University Graduate Student Association (GSA) is to represent and support the interests of the University’s current and future graduate student community by supporting scholarly activities and providing leadership, service, and social opportunities (<http://www.clubs.psu.edu/up/gsa/>). GSA exists to enrich the experience of the University’s graduate students, all of whom are members of GSA. GSA accomplishes these objectives by flexibly responding to the changing collective needs of its primary constituents –graduate students. GSA, recognized by the University as the graduate students’ central organization, is appropriately organized to accomplish the following unique functions:

* advocate the position of the graduate student body to other University and external constituencies
* represent the broad interests of graduate students to the University’s academic units through a network of departmental delegates
* furnish accessible, reliable, and valuable information, services, and programs to current and prospective graduate students
* provide a forum for interaction among an extraordinarily diverse graduate student population
* encourage and facilitate communication with and interaction among other graduate student organizations
* seek funding to support organizational activities
* promote a sense of community among graduate students and their families.

Graduate students in the Department of Meteorology and Atmospheric Science elect GSA assembly delegates every spring to attend assembly meetings and advocate for meteorology graduate students. GSA provides many services including a graduate student orientation, film series, garden plot rentals, a newsletter, a tax guide, an annual guide to graduate life, a babysitter’s list, and an alternative health insurance. Please visit their website for more information.

**7.3 Department of Meteorology and Atmospheric Science Graduate Student Governance**

**Graduate Advisory Council (GAC).** Graduate students in the department are encouraged to take an active role in departmental decision-making and governance through the Graduate Advisory Council (GAC). The GAC is the committee made of graduate student elected representatives. All representatives meet monthly at GAC meetings with the GAC chair and a faculty member who serves as the faculty liaison. All graduate students are welcome to suggest issues and to attend GAC meetings. The GAC chair also organizes the annual fall graduate forum and spring graduate student meeting to allow for discussion and resolution of issues pertinent to the graduate program of the department.

Students can run for a number of one-year positions that are elected at the end of spring semester at the annual graduate student meeting. Elected positions include the GAC chair and delegates to:

**Graduate Academic Program (GAP) Committee**. The GAP committee consists of several faculty members and one graduate student representative. This committee meets regularly to assess graduate core classes, recruitment and diversity issues, graduate student progress reports, and any other issues related to academics and the graduate program.

**Undergraduate Academic Program (UGAP) Committee.**  The UGAP committee consists of several faculty members and one graduate student representative. This committee meets regularly to assess undergraduate classes, options, minors, requirements, diversity issues, teaching assistant issues, and any other items related to undergraduate education in the department.

**Faculty Meeting Representative.** The graduate faculty representative (usually one student and one backup rep) attends all open faculty meetings in the department, informs graduate students of relevant matters that transpire at those meetings, and advises faculty on the opinions and concerns of students.

**Graduate Student Association (GSA) Assembly Meeting Delegate.**  Up to two students can be elected as GSA representatives. They attend the monthly assembly meetings, inform students about relevant issues on which the GSA is working, and present opinions and concerns of meteorology graduate students to the GSA assembly. GSA representatives can also serve as the liaison for the Graduate and Fixed-Term Employee Organization (GFTEO).

**7.4 The Penn State University Branch of the American Meteorological Society (PSUBAMS)**

PSUBAMS consists of four elected undergraduate or graduate student officers, a faculty adviser, and all interested undergraduate and graduate meteorology students, faculty, and staff. It meets approximately once a month. Meetings usually feature a presentation by a guest speaker who may be a faculty member, a student, or a member of the outside professional world. The programs deal with aspects of meteorology that interest all levels of meteorology students. Meetings are followed by refreshments and informal discussion. Other activities have included hayrides and snow tubing. Please see their website for more information.

**7.5 Campus Weather Service**

Email: [cws@ems.psu.edu](mailto:cws@ems.psu.edu)

The [Campus Weather Service](http://campusweatherservice.com/) provides an array of weather forecasting services to the community and media, free of charge. Any student, including graduate students, with an interest in meteorology is welcome to join CWS. Newcomers to the organization do not need any prior forecasting experience. Training is provided on a weather shift by an appointed shift manager. General meetings are held about once every other month. Please see their website for more information.

**7.6 Weather Risk Management Club**

[The Weather Risk Management Club](http://www.wxriskclub.org/) serves students who are interested in how weather affects a wide range of industries, including energy, agriculture, insurance, construction, retail, and transport. These applications rest at the intersection of meteorology and risk management. The Weather Risk Management Club meets regularly to host speakers who discuss these sorts of applications.

**7.7 Annual Graduate Research Exhibition**

The [Graduate Exhibition](http://gradschool.psu.edu/exhibition/) celebrates research in all its aspects as an essential and exciting part of graduate education at Penn State. Established in 1986, the Graduate Exhibition places special emphasis on communicating research and creative endeavor to a general audience and offers an unusual opportunity for professional development by challenging graduate students to present their work in clear, comprehensible terms to people outside their fields.

The Graduate Exhibition is also a rare opportunity for graduate students to see themselves as part of the larger University community, to share their creativity, and to appreciate the breadth of quality research being done at Penn State. Each year, graduate students throughout the University are invited to participate.

The Graduate Exhibition is held on Penn State's University Park campus and includes music and theatrical performances, a visual arts display, and poster exhibits of students' research. All events are free and open to the public. Please visit their website for more information.

**7.8 Intramurals**

Graduate students in the Department of Meteorology and Atmospheric Science have been active in PSU’s intramural programs. Volleyball, flag football, basketball, and softball are only a few of the intramural sports offered at Penn State (and exceled at by graduate students in our Department!). More information about intramural offerings and signup deadlines can be found at <https://studentaffairs.psu.edu/health-wellness/recreation-leisure/im-sports>. Talk to some of the veteran graduate students to find out about current teams or starting other teams.

**7.9 Weather Communications Group**

The [Weather Communications Group](http://www.met.psu.edu/weather/weather-communications-group) is a microcosm of the three-fold mission of the land-grant university: teaching, research, and public service. The members of the Weather Communication Group actively are involved in teaching undergraduate synoptic meteorology classes (METEO 413, 415, 416) along with the courses related to the weather communications option (METEO 481–485). The group houses the Pennsylvania State Climate Office, which explores various new applications of weather and climate information to state agencies and businesses. The State Climate Office offers up to a dozen students each semester the opportunity to gain practical experience in the field of applied climatology. The Weather Communication Group also produces a weeknight 15-minute weather program, *Weather World*, from the department television studio, which is broadcast across the state on public television and on the Pennsylvania Cable Network (PCN). The group sponsors several weather camps (for teachers and kids) during the summer.

**Section 8. Departmental Policies**

Writing a coherent document explaining departmental policy is difficult. Subtleties in the circumstances can dramatically change how both a graduate student and the administrative staff handle a certain situation. The department's administrative and support staff are excellent and know these subtleties. Some of these departmental policies are available on the web; in other cases, it is best to consult with the person on staff who handles these matters *before* you take action.

**8.1 Travel**

When planning a trip that is being funded or reimbursed by any source other than from your personal finances, it is imperative that you work directly with the front office staff as soon as you are aware of your trip. All travel is required by university policy to be handled in a specific manner. Failure to follow this procedure may inhibit reimbursement. International travel requires students to register with PSU’s Travel Safety Network (https://global.psu.edu/article/travel-safety-network-tsn ) 60 days prior to departure.

**8.2 Purchasing**

Please discuss the purchasing of equipment or supplies related to your education or for your office with your adviser. Chad Bahrmann should approve all ordered computer or IT equipment coming into the department. The front office staff will assist you with the appropriate procedures for purchases.

**8.3 Computing**

Please visit the department’s [computing web site](http://sites.psu.edu/metcompfaq/) for more information on computing and printing. Problems should be reported by emailing support@meteo.psu.edu.

**8.4 Photocopying**

A code is required for use of the department's photocopier in room 532. If you are currently a teaching assistant for a course, you will be given a code to use for course-related materials. If you need to make copies directly related to a specific grant, please see your adviser.

**8.5 Moving Furniture/Offices**

Please notify the front office staff if you are changing offices. All furniture in each office should remain in its current place unless you have discussed the arrangement with the Administrative Assistant.

**8.6 Facility Maintenance**

Please e-mail [meteo\_facilities@meteo.psu.edu](mailto:meteo_facilities@meteo.psu.edu) concerning any problems with your office (e.g. bad door jams, electrical outlets). They will contact the Office of Physical Plant (OPP) to resolve the problem.

If you are in the building after normal business hours and there is a facility problem that requires immediate attention (e.g. overflowing toilets, burst pipes), please contact OPP directly at 814-865-4731.

**Section 9. Contacts, Resources, and Links for Meteorology and Atmospheric Science Graduate Students**

Centre County Information: <http://www.centrecounty.org/>  
Centre Connect: <http://www.centreconnect.org/>  
Centre Region Parks and Recreation: [http://www.crpr.org/](%20http:/www.crpr.org/)  
Chamber of Business and Industry of Centre County: <http://www.cbicc.org/>  
Centre County Convention and Visitors Bureau: <http://visitpennstate.org/>  
Centre Region Council of Governments: <http://www.crcog.net/>  
Borough of State College: <http://www.statecollegepa.us/>  
Bellefonte Borough: <http://bellefonte.net/>  
Benner Township: [http://www.bennertownship.org/](%20http:/www.bennertownship.org/)  
College Township: <http://www.collegetownship.org/>  
Ferguson Township: <http://www.twp.ferguson.pa.us/>  
Harris Township: <http://www.harristownship.org/>  
Patton Township: <http://twp.patton.pa.us/>  
All other county townships and boroughs: <http://pa-centrecounty.civicplus.com/index.aspx?NID=568>

**Section 10. Hyperlinks to Various M.S. and Ph.D. Forms**

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| --- | --- |
|  | [Internal Committee Form](http://www.met.psu.edu/academics/graduate-studies/graduate-student-handbook-1/selected-forms/InternalCommitteeForm.pdf/view?searchterm=Internal%20Committee%20Form) |
|  | [M.S. Progress Report](http://www.met.psu.edu/academics/graduate-studies/handbook-graduate-students/selected-forms/GradProgressReportForm-MS-April2014.docx/view) |
|  | [Ph.D. Progress Report](http://www.met.psu.edu/academics/graduate-studies/handbook-graduate-students/selected-forms/GradProgressReportForm-PhD.docx/view) |
|  | [Table 7](http://www.met.psu.edu/academics/graduate-studies/graduate-student-handbook-1/selected-forms/Table7.pdf/view?searchterm=Table%207) |
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