

GRADUATE STUDENT HANDBOOK

**Policies and Procedures for Graduate Students in
The Department of Astronomy and Planetary Science
Northern Arizona University**

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Introduction

Welcome to the Department of Astronomy and Planetary Science.

The goal of a graduate education is to prepare a student for a professional career working at a high level. Common outcomes for students with PhD degrees in astronomy and/or planetary science include faculty, research, and/or teaching positions at a college or university level; technical jobs working in industry and/or at a research facility; and education and outreach positions — but there are many other possible jobs.

For a student to earn a PhD, they must demonstrate proficiency in developing and completing science projects and their expertise in their given research area. It is likely that by the time the student leaves NAU they will know more about their dissertation topic than their committee members and their advisor — and perhaps more than anyone in the world. Reaching this level of expertise requires hard work and dedication to research. There are no shortcuts to achieving PhD-level knowledge and skills.

The primary activity in which a PhD student will be engaged during graduate school is research. However, a student will also take classes, and in some cases teach classes. A student will also develop critical professional skills in communication and presentation. PhD students are expected to demonstrate: the ability to generate original ideas, command of the literature, proficiency in designing, analyzing, and interpreting research, as well as aptitude in scientific writing (including but not limited to publication of research results in major professional refereed journals). Additionally, the department hopes to be able to provide opportunities for PhD students to develop basic skills in teaching. PhD students are expected to be self-motivated and largely direct their own research program with advice and counsel from the Faculty Advisor and Dissertation Committee.

The goal of the faculty is to help graduate students reach their PhD milestones through attentive mentorship, exposure to opportunities, and scientific interactions.

The aim of this document is to establish the expectations for PhD students and faculty as students proceed through the PhD program. It provides students with information on how to complete the graduate program, and provides faculty with information needed to successfully direct the graduate program of their students. Detailed information regarding general Graduate College requirements is available in the on-line [Graduate Catalog](#) and also on the [Graduate College website](#). Some of the information presented in those documents is duplicated here for clarity. The Graduate College has final authority on all policy matters. Changes to Graduate College policies usually automatically change the Department of Astronomy and Planetary Science policies and procedures except where explicitly stated.

Graduate education provides training for a professional career, and we expect students to be active and engaged members of the department. This role includes participating in department events (such as seminars and colloquia), excelling in course performance, exhibiting an attentive and innovative approach to teaching and research, maintaining a high standard of professional ethics, and demonstrating mature and responsible behavior in all interactions with faculty, staff, visitors, and students.

Note: It is the student's responsibility to become aware of and adhere to all policies and requirements established by the Graduate College and the Department of Astronomy and Planetary Science. The final responsibility for meeting all Department, Graduate College, and University requirements and deadlines rests with the student.

For convenience, the Department of Astronomy and Planetary Science is usually referred to in this document as "the department."

Admission to the Graduate Program

The Department of Astronomy and Planetary Science offers a PhD in Astronomy and Planetary Science. Students must complete and submit the admissions application form at NAU's [Graduate College website](#). Please follow directions and submit all materials online.

Successful applicants usually will have a bachelor's or master's degree in Physics, Astronomy, Chemistry, Geoscience, Planetary Science, or a related field, with a 3.0 GPA or above. Evaluation of applications for Fall admission will begin after January 1 of that year, with priority consideration given to applications received by December 1 of the prior year. Our graduate program only accepts students for Fall admission. Application fee waivers have been granted in the past to students who apply by the priority deadline and who meet a minimum GPA threshold, although this program is subject to annual review and renewal.

An application for the PhD in Astronomy and Planetary Science must include the following:

- A statement of interest describing (1) reasons for applying to NAU's PhD program in Astronomy and Planetary Science as well as (2) professional interests and goals.
- A scientific/technical writing sample such as a senior thesis, M.S. thesis, major class paper, or professional report demonstrating analytical and writing skills.
- Three letters of recommendation, at least two of which should be from faculty members.
- An official transcript of undergraduate work, submitted to the Graduate College as described within the online application.
- A current CV.

For applicants where English is not their primary language, a TOEFL score must be submitted and the applicant must demonstrate sufficient fluency in spoken English to be able to teach introductory labs and work in an English-language research setting. Applications *do not* require a reported GRE score (general or subject-specific).

Successful applicants have typically contacted at least one department faculty member prior to application. If admitted, this faculty member (or a primary faculty member listed in the formal application) will be assigned as an initial PhD advisor (see [Advising](#)).

Student Life

Student Roles and Responsibilities in the Department

All Department of Astronomy and Planetary Science graduate students are expected to be active, participating members of the department and to behave with integrity in all interactions with the faculty, staff, visiting scientists, students, and the general public. Graduate study not only involves teaching and research responsibilities but also gives students the practical skills to develop into a professional scientist. These qualities are developed through interactions with faculty, other graduate students, and visiting scientists; attendance at department seminars and colloquia; attendance and presentation of papers at scientific meetings; and publication of research results. Students also may take on or be assigned some small service activities within the department. All of these activities help students develop the teaching, research, and service skills the student will need to succeed as a professional scientist.

All graduate students in the Department of Astronomy and Planetary Science are expected to adhere to the university's [Academic Integrity Policy](#) and [Student Code of Conduct](#). Academic integrity means honest and ethical conduct in all aspects of academic life. Integrity is expected of everyone -- students, faculty, and staff -- within the NAU community in all academic undertakings, regardless of venue (including but not limited to: classroom, laboratory, field work or other research-related activities, internships/externships, paid positions, etc.) or medium (including but not limited to: assignments, written work, data gathering, oral presentations, fellowship applications, etc.). Academic integrity is expected not only in formal coursework settings, but in all University relationships and interactions connected to the educational process, including the use of University resources. The value of the intellectual contributions of faculty, staff and students and their reflection in the broader impact and reputation of the University depend on the assurance that every member of the academic community adheres to the very highest standards of ethical behavior.

Students carry significant responsibilities in the department in terms of teaching and research. A Graduate Teaching/Research Assistant (GTA/GRA) is an employee of the department, University, and state, and is therefore a representative of these institutions on campus, at other institutions, at professional meetings and conferences, and in all other professional settings. Therefore, graduate students are expected to exhibit high professional standards and to conduct themselves in a professional manner. Implicit in admission to the graduate program is the expectation that graduate students will develop and demonstrate a strong sense of integrity, in both the student's academics and peer interactions. The relationship between a faculty member and graduate student is unique to the academic environment and is essential to the advancement of both the student and faculty member. As a consequence, the relationship must not be compromised by unprofessional conduct by either party.

Nearly all departmental activities entail the use of facilities, equipment, and operational budgets provided through state and federal governmental funds. Anyone using state or University property for reasons other than those intended is liable for damages and subject to disciplinary action, dismissal, and/or legal action. Telephones, copy machines, postage, computers, vehicles, and all other University or department property may not be used for personal reasons. Please check with the department office or a faculty advisor if there is doubt about the difference between official and private actions.

Students are expected to ask permission before using facilities or equipment not already assigned to their lab or project. Although some equipment is kept in common storage areas, it may well be considered the “property” of a specific research project, laboratory, or teaching area.

Appropriate keys are issued to students by the department office. Security demands that the student safeguard keys and not lend them to others. It is illegal to duplicate University keys. Also, students should be very conscious about locking doors and closing windows when they leave offices, classrooms, laboratories, and the building.

Student Representative to Faculty

The department graduate student body should hold elections once a year (typically in August or September) to select a Student Representative to the Faculty. The goal is to increase communication between students and faculty.

This representative should be a student who has passed both their Comprehensive Exams, and should be a full-time student and in good academic standing. The graduate student representative is expected to serve for one year; if the student leaves the position before one year a new election will be held, but this should be an exceptional case. Students are only allowed to serve as Student Representative once during their graduate career at NAU unless the faculty agree otherwise. In the event that the only willing potential representative does not meet the requirements for serving, the faculty may grant an exception. Finally, in the event that no graduate student is able or willing to serve as representative, the faculty will recommend representative(s) (who may decline the position).

The duties of this representative include attending the monthly faculty meetings (until sessions of confidentiality, during which the representative will be excused) and to meet regularly with the Graduate Coordinator.

This representative should, as appropriate, canvas the graduate student population to understand topics of concern or that the students would like further information about and bring these topics to the Graduate Program Coordinator, the Graduate Program Committee, and/or the faculty. The student should also report back to the entire graduate student body on

information learned from the Graduate Coordinator and/or faculty meetings. The representative is also responsible for collecting and synthesizing graduate student feedback and inputs on issues related to department hiring.

Expectations of GTAs and GRAs

A Graduate Teaching Assistant (GTA) is typically the primary instructor for undergraduate lab sections in two semesters. A typical load for a departmental GTA eligible for a stipend, tuition waiver, and benefits (i.e., working 20 hours per week) consists of three 1-credit 2.5 hour lab sections per week. GTAs are expected to show up on time for laboratory preparation meetings and for their labs, be available during the advertised office hours, and focus on helping their students during lab instruction. The department will identify a GTA supervisor, who will either be a Lab Manager (staff member whose job includes ensuring that the labs are functioning, both on a technical side and a personnel side) or a faculty member. The Department Chair will appoint/announce the Lab Manager at the beginning of each academic year. The lab manager or supervisor must be notified as soon as possible for any absences from the student's lab assignments. GTAs are evaluated by the students in their labs as well as the lab manager each year and reappointment is contingent on satisfactory performance based on those evaluations. GTAs are required to attend the training session held the week before the fall semester begins and weekly laboratory preparation meetings. Time commitments for GTAs should not exceed more than 20 hours per week on average (see the NAU Graduate College Handbook; [link](#)), and students should inform their advisor and/or the GPC if their weekly GTA workload exceeds this limit.

It is the goal of the department to provide the opportunity to work as a GTA for at least one semester for all students who want to gain teaching experience. However, at present the number of GTA positions is limited, and it may not always be possible for all students to acquire this level of teaching experience. Students should communicate with their advisors about the availability of GTA opportunities and plans to gain teaching experience, if desired.

Graduate Research Assistants (GRAs) are supported on internal or external research projects awarded to a faculty member in the department. GRAs are expected to work on the funded project that is paying their salary, under the supervision of the PI of that project (or their designee, as appropriate). GRAs are expected to communicate appropriately with the PI, who will typically be their faculty advisor, and produce deliverables (e.g., papers, conference presentations, datasets) as appropriate to demonstrate satisfactory research progress and relevance to the funded project.

Financial Support

Most students in the department are awarded a GTA or a GRA. A GTA/GRA typically provides students with a stipend, tuition waiver, and health benefits during their time as in-residence graduate students. Both GTA and GRA positions are contract assignments and are typically

renewed annually upon satisfactory performance (as indicated through the [annual evaluation process](#)). However, GTA assignments can be revoked at any time if performance is seriously unsatisfactory, such as multiple unexcused absences for either teaching labs or weekly lab preparation meetings (see “Termination” in the [NAU Graduate College Handbook](#)). GRA assignments could be revoked mid-year only in cases of severe misconduct.

A GTA is technically only awarded for the fall and spring semesters, though summer teaching opportunities may be available occasionally. It is most common that a GTA moves onto a summer GRA position following the completion of their teaching duties. Similarly, a GRA often includes funding to work full time (40 hours per week) on research during the summer. In both circumstances, the student should check with their advisor to determine funding availability.

Due to the limited number of GTA positions and the competitiveness of external fellowships (see below), most of the graduate students in the department are likely to be funded through GRA positions for most of their time in the program. Students should talk to their advisor and/or the Graduate Program Committee with any questions or concerns. Continuing to fund students who are already in the program, through any combination of mechanisms, is a top priority for the faculty.

Students are strongly encouraged to apply for external graduate fellowship opportunities (e.g., through NSF and NASA), and the department and faculty will support these efforts to the greatest extent possible. The financial details of these fellowships differ from GTA/GRA positions and vary with funding platform. Questions about the implementation of these awards should be brought to the Graduate Coordinator who will, as appropriate, coordinate with the Graduate College, NAU’s Office of Sponsored Projects, and other departments as necessary.

Students who have won independent fellowships (e.g., an NSF GRFP) can have great freedom to choose their research path, advisor, project, and project timeline, although the ability to freely explore ideas not contained in a funded proposal does not apply to all fellowships (e.g., NASA FINESST). Importantly, these students are still members of the department, and should follow the general approaches that apply to all graduate students. For example, these students will still need to have an advisor in the department, will need to complete the annual evaluation process, and will be evaluated on the usual timeline by the Graduate Program Committee. Students should also recognize that they are still training to become successful independent researchers, and so regularly meeting with advisors and research committees should be prioritized.

Residency Requirements

All students are expected to be physically present on the Northern Arizona University Mountain Campus (or nearby institutions such as Lowell Observatory or USGS) during the period that they are enrolled in the program. Physical presence in Flagstaff is particularly important during the period when students are taking classes and/or teaching labs. Short-term excursions (1-2 weeks) away from campus during the academic year and/or absences during the summer must

be discussed with the student's faculty advisor. Longer periods away from campus can be formally requested (see [Leave of Absence](#)) or can be informally negotiated with advisors and the Department Chair.

State residency for tuition purposes is not required of students, but is recommended (as it can prevent tuition waiver-related issues should the student win a fellowship). For details, please see NAU's [residency information page](#).

Harassment Policies

No forms of harassment will be tolerated by the department or University. We include here all interactions between and among any members of our department: faculty, staff, and students. Information on what constitutes harassment and how to report can be found in NAU's [Nondiscrimination and Anti-Harassment](#) policy and with the [Department of Equity and Access](#). Information regarding the Graduate College harassment policy can be found in the [Graduate Assistantship, Traineeship, & Fellowship Policy Handbook](#). Finally, per NAU policy, issues of sexual harassment must be reported to NAU's [Title IX Coordinator](#).

Plagiarism Policies

Plagiarism is prohibited by NAU's academic policies and [Student Code of Conduct](#). After the first incidence of plagiarism, the student will receive a written warning and the Department Chair will be notified. After the second incidence of plagiarism, the student will receive a written notification and an academic integrity reporting form will be submitted ([link](#); which includes notification to the Associate Dean of Academic Affairs). This report will be added to the student's file. Please note that plagiarism rules apply to all coursework and all research endeavors.

There are three common types of plagiarism: (1) direct (verbatim) plagiarism, (2) paraphrasing (or substitution) plagiarism, and (3) mosaic plagiarism. Direct plagiarism is copying exact words or wording from a source without giving attribution. Paraphrasing plagiarism is using someone else's ideas and concepts without attribution, even if you change the words. Mosaic plagiarism is stitching together various phrases that are not your own without attribution. If the student is in doubt about how to construct some specific text, ask an advisor or course instructor.

Academics

Program of Study

By a student's third semester of coursework, the student, in consultation with any/all advisors, should complete a tentative Program of Study Form. This tentative form will help with coursework planning. The [Program of Study Form](#) can be downloaded from the Graduate College website and is submitted to the Graduate College when the student applies for candidacy. Table 1 (course offerings; see below) should be used to outline the planned series of coursework for the student. The Program of Study clearly specifies the required courses and lists a tentative dissertation topic. The faculty advisor and Chair of the Department of Astronomy and Planetary Science must approve the original Program of Study, as well as any revisions to the Program of Study. The Graduate Coordinator and dissertation committee can/should also be consulted on issues related to the Program of Study. Once a Program of Study has been approved, a student is expected to adhere to the Program unless an updated Program is approved via the process just described. The Program of Study Form, including any revised Programs of Study, must be copied to the Graduate Coordinator, the graduate student's file in the Department of Astronomy and Planetary Science, and the faculty advisor. Per NAU policy, students may adopt any Program of Study that has been in effect during their tenure in the department.

General Coursework Requirements

The student, advisor(s), and dissertation committee will decide on the best courses for the student's Program of Study. All graduate students must maintain a GPA of 3.0 or better. Only six credits of "C" grades may be used in the Ph.D. degree program, all other grades must be "A" or "B." A student with more than 6 credits of graduate course work with a grade of "C" or below are automatically placed on academic probation and may not be allowed to continue in the Ph.D. program, regardless of GPA.

Graduate students do not normally repeat courses, but if a grade of "C," "D," or "F" is received in a graduate course, students may repeat that course with faculty advisor approval. If a course is repeated, both grades are used in the computation of the overall grade point average (GPA). Credits earned for repeated courses may only be used once to fulfill graduate requirements. These course repeat rules are covered by [NAU Policy 100318](#).

Students who are GTAs or GRAs must be full-time students, which means enrolled for nine credits during every semester. Most students in their first two years will take two classes (6-8 credits) per semester. The remaining credits might be courses such as AST598 (Planetary Analogs), AST599 (Fellowship writing – course number likely to change at some point), AST685 (Graduate Research), or other similar courses. Graduate research credits must also have a

detailed work plan that is commensurate with the number of credits the student is receiving for the work, and it is up to the specific AST685 faculty mentor to define a grading rubric and to evaluate student performance. Typically a student will be enrolled in their advisor's section of AST685, if their advisor is an NAU faculty member. If the primary advisor is off campus, the student may enroll in their faculty advisor's section of AST685, the Graduate Coordinator's section, or the Department Chair's section.

After a student has completed their first four semesters (and therefore, in most cases, most or all of their coursework), the student should enroll in AST685 for up to 9 credits (i.e., full time research). At present, NAU caps the number of AST685 credits per section (i.e., per faculty member) at six credits, so students may need to enroll in two different sections to reach 9 credits total. These two sections can be split between the committee chair/faculty advisor, any other committee or faculty member, the graduate coordinator, and/or the Department Chair. The student should consult with their committee prior to enrolling.

Students in their final year of their PhD should enroll in AST799 ("Dissertation"). As of August, 2020, 15 credits of AST799 will be the requirement to graduate; for most students, the easiest way to do this is to enroll for 9 credits of AST799 in each of their final two semesters. The Graduate College strongly suggests that students do not enroll in AST799 until they are close to writing and finishing their dissertation (i.e., the last two semesters), as these are dissertation-focused credits. During the term the student completes and defends their dissertation, the student must enroll for at least one credit of 799. If the student does not maintain continuous enrollment after work has begun on their dissertation and the student does not have an approved leave of absence on file with the Graduate College and wish to resume work, the student must submit a new application for admission and register for additional credits of AST 799 in an amount equal to the number of such credits missed while not maintaining continuous enrollment. Please see NAU's [continuous enrollment policy](#) for more details.

The form for signing up for 685 or 799 can be found here:

https://nau.edu/wp-content/uploads/sites/145/Individual_Study_Form.pdf

If a student is carrying out significant research in another academic unit the student may also enroll in 799 courses with a different prefix (i.e.,g., GEO799, CS799, etc.). However, the majority of the 799 credits should always be in AST799.

Graduate credit may not be earned for courses numbered 100–399. Up to six credits of 400-level courses from NAU may be used for a Ph.D. degree program with the approval of the dissertation committee (which requires filing of the Override Authorization-Audit/Class Links/Out of Career Form, available from the [Registrar's website](#)).

The maximum graduate course load is 16 credits per semester. Graduate teaching and research assistants (i.e., most students in the DAPS PhD program) may only take a maximum of 12 credits per semester. Note that enrolled courses numbered 100–399 do count towards the

maximum course load and may be recommended to graduate students by a research committee to supplement the student's knowledge base in addition to their required graduate course load.

Contingent on approval of the faculty advisor (in consultation with the dissertation committee) and Department Chair, any number of graduate credits required for the Ph.D. degree may be transferred to NAU from another institution. However, only a maximum of 24 credits of graduate-level coursework completed during a Master's or Ph.D. degree can be used to meet degree requirements. In general, it is recommended that transfer credits be used to replace graduate elective courses and not required graduate core classes.

General guidelines and procedures for NAU doctoral programs are described at the Graduate College [resources website](#).

Specific Coursework Requirements

All students must complete a minimum of eight classes (four core classes and four electives), typically during their first two years in the program. The four core classes required of all students are the following:

- AST 501 (Fundamentals of Planetary Science I) (3 units)
- AST 502 (Fundamentals of Planetary Science II) (3 units)
- AST 570 (Astrochemistry) (3 units)
- AST 550 (Spectroscopy) (3 units)

Additionally, students must take four additional relevant graduate-level courses. These could be (for example) in Astronomy/Planetary Science (AST prefix), Physics, Computer Science, Geology, Environmental Science/Remote Sensing, Informatics, Chemistry, etc. The selection of these elective courses should be made in consultation with the faculty advisor and, as appropriate, dissertation committee.

The expected course rotation, as of this writing, is shown in Table 1. Although a few classes are offered every year, most are offered once every two years. Students should therefore plan their schedules according to the information in Table 1 so they can complete their coursework in the recommended first two years. Graduate Research (AST685) and Dissertation (AST799) can be offered any semester and should be discussed with the specific faculty members well in advance (the faculty member may need to request that a section be created). A section of Reading for the Comprehensive Exam (AST587) can be created for students in the semester in which they are taking their PhD Comprehensive Exam, with the final grade for these credits tied to the student's performance on the exam.

Professional Development Requirement

Doctoral students at NAU are required to engage in at least five hours of professional development activities (see NAU [Policy No. 100805](#)). The goal of these activities is to help the student develop career-critical skills that may not be taught as part of the formal curriculum. Students should discuss with their advisor which professional development options are best suited to their career goals. Allowable professional development activities are broadly-defined, must be outside of the student's planned coursework, and can include:

- attending and presenting at a relevant scientific conference;
- creating new educational materials (e.g., guest lecturing in undergraduate courses, designing laboratory exercises for undergraduate courses);
- completing a scientific or proposal writing workshop,
- engaging in an internship outside of planned GRA duties;
- completing formal training in education and public outreach;
- leading non-credit workshops or seminar series;
- attending trainings in inclusivity, diversity, and equity; or
- enrolling in additional software development courses or workshops.

Note that nearly all professional societies (e.g., DPS, AAS, and AGU) offer workshops in these areas (often free of charge) preceding their large annual meetings. Additionally, NAU (especially through the Graduate College) provides an annual lineup of relevant workshops and seminars. Students must demonstrate completion of the professional development requirement to the department and Graduate College when applying for candidacy.

Table 1: Planned Rotation of Graduate Courses

Course Number	Topic	Fall	Spring
AST501*	Fundamentals of Planetary Science I	Odd	
AST502*	Fundamentals of Planetary Science II		Even
AST510	Exoplanets	Even	
AST520	Astroinformatics		Odd
AST550*	Spectroscopy		Odd
AST555	Planetary Applications of Remote Sensing		Even
AST560	Planetary Geomorphology		Even
AST565	Planetary Geodynamics		Odd

AST570*	Astrochemistry	Even	
AST580	Observational Astronomy	Every	
AST598	Planetary Analogs	Every	
AST599	Fellowship Proposal Writing	Every	

* required course

Advising

Graduate Program Committee

The department's Graduate Program Committee (GPC) establishes and reviews the graduate policies and procedures. The Graduate Program Committee is chaired by the Graduate Program Coordinator and includes (at least) two additional faculty members appointed by the Department Chair. The Graduate Program Committee is responsible for periodic review of the policies and procedures concerning the graduate programs of the department. Significant revisions to the policies and procedures as recommended by the Graduate Program Committee are subject to approval by the Department Chair, review by the graduate students, ratification by the faculty and, as appropriate, final approval by the Dean of the Graduate College.

The Department GPC reviews applications from prospective students and recommends admission of applicants. The Graduate Coordinator recommends to the Department Chair candidates for different types of financial support, such as GTAs and GRAs. Applications for admission are reviewed in the spring semester of each academic year for admission the following fall.

Every incoming student will be assigned an advisor. In many cases, this is a faculty member whom the student applied to work with. In cases where that match is not made before the student's arrival on campus, the GPC will assign a temporary advisor to the student to help the student learn about research going on in the department and to help the student get started finding a permanent primary advisor and project. This temporary advisor need not be the student's ultimate research and dissertation advisor. In the case where an incoming student's primary research advisor is off campus (e.g., Lowell or USGS), an institutional advisor from within the department will be assigned. In all cases, the assignment of an advisor to incoming students does not imply a funding commitment from the advisor. Finally, a primary or secondary advisor with administrative privileges at NAU is sometimes referred to as a "faculty advisor."

Primary Advisor and Graduate Committee

Primary Advisor

Every student will be assigned an advisor upon entering the program. In cases where a student starts at NAU as a GRA this advisor will also be their research advisor/mentor (i.e., PI of the research project). In cases where a student starts at NAU as a GTA, an advisor with similar interests will be assigned. This initial advisor will help the student get started in the program (choosing classes, making introductions, and overall guidance).

Each student must identify a primary advisor by the end of their second semester. This may be (or is likely to be) the advisor assigned upon entry to the program. Selection of a primary advisor does not necessarily obligate that advisor to pay the student as a GRA, though current and future funding is a topic that student and potential primary advisor should discuss. (Identifying co-advisors could be beneficial and would capitalize on the department's highly complementary research areas.) If the primary advisor is a NAU faculty member, that advisor also serves as chair of the student's dissertation committee. For students whose primary advisor is off campus, an institutional advisor must be selected from the department faculty. The minimum role of this institutional advisor is to help guide the student through administrative requirements and to serve as chair of the dissertation committee (per Graduate College policies; the off-campus advisor serves as co-chair). As mentioned above, a primary or institutional advisor with administrative privileges at NAU is sometimes referred to as a "faculty advisor." It is expected that a primary advisor is to be located in Flagstaff (e.g., NAU, Lowell, USGS).

The primary advisor works closely with the student in all aspects of the graduate program and has the following responsibilities:

- Function as a research and career mentor for the student.
- Work with the student to develop a research project that is the right scope for a PhD.
- Advocate for the student.
- Help the student find and participate in professional opportunities (e.g., conferences).
- Work to ensure open communication with the student.
- Work with the student to form the student's dissertation committee.
- Work with the student to develop a Program of Study that meets the needs of the student and the requirements of the graduate program.
- Work with the student to ensure that the Dissertation Committee meets periodically and functions effectively.
- Review and approve the student's dissertation before submitting it to other members of the student's Dissertation Committee for review prior to the final oral defense.
- Periodically review the student's career and program progress.
- Organize and administer the student's Comprehensive Exam.
- Organize and administer the student's final oral defense of the dissertation.

- Approve the student's application for graduation.

Switching Primary Advisor

It is not uncommon for students to change advisors during graduate school. The decision to change primary advisor can be amicable — the student's primary research could shift towards the expertise of a new advisor, and all parties agree that it makes sense to switch the formal primary advisor. Here, the Graduate Coordinator should be informed and an updated Dissertation Committee Recommendation form should be submitted to the Graduate College ([link](#)).

It can also be the case that the decision to switch primary advisor is not amicable. For example, there may be a mismatch in advisor and advisee research or communication styles, or there may be funding/support issues with the primary advisor. Here, the student's decision to switch advisors should not be undertaken lightly, as it may result in a student starting over on a research project, an increase in the time to graduation, and/or disruptions and/or significant modifications to financial support. Similarly, the advisor should not take the decision to drop a graduate student lightly, as graduate students are integral and essential to faculty and department research success. It is in the interest of both parties to work together to create a productive, positive, and successful research partnership.

If a student decides to pursue changing advisors under non-amicable circumstances, the student is encouraged to discuss this decision with the Graduate Coordinator and/or GPC. The student's right to confidentiality on this topic must be respected by the Coordinator and GPC. The student should follow the guidance for finding a (new) primary advisor ([here](#)). If informed of the situation, the Graduate Coordinator may be able to find department resources (e.g., a GTA appointment) to support the student while they search for a new primary advisor. As department resources are often scarce, this support cannot be guaranteed.

Graduate (Dissertation) Committee

The graduate, or dissertation, committee serves two purposes. The first is to guide the student through their professional and research development. This guidance may include providing suggestions on the student's research topic, working with the student on various research topics and tasks, and making introductions to various contacts in the field (taking advantage of the advisor's professional network). The second purpose of the dissertation committee is to ensure that the student is ready to advance to candidacy and carry out their research project (through the Comprehensive Exam), ensuring that the student has completed PhD-worthy work and that they are ready to graduate (through the dissertation defense). Students should work with their primary advisor to assemble the graduate committee, and the committee must be finalized by the end of the student's third semester. Students are encouraged to begin thinking about committee membership as early as their first semester. Students are solely responsible for the finalized membership of their committee.

The graduate committee is composed of at least four members: the primary advisor and three other members. The committee can have more than four members, as appropriate. When the primary advisor is not a member of the department faculty, the secondary advisor serves as the committee co-chair. Per NAU Graduate College policy, at least one other committee member (beyond the committee chair or DAPS-affiliated co-chair) must be a full-time DAPS faculty member. Tenure-line, Research Professor line, or Teaching Professor line all count as “full-time DAPS faculty”, but adjunct faculty do not. Additionally, DAPS requires that tenured, tenure-track, adjunct, research, or affiliate faculty from the department make up at least 50% of the student’s committee (for example, 2 out of 4 or 3 out of 5 members must meet these requirements).

By NAU policy, one committee member must be from outside the department, and could be either from another department at NAU or from an institution outside of NAU. Lowell and USGS are common outside institutions, but some students and advisors choose committee members who are not in Flagstaff. Outside advisors and committee members — particularly those from outside NAU — should be informed as to the level of commitment that is expected from them, and whether and how often they will be expected in Flagstaff. These decisions should be made in consultation with the primary advisor.

When the committee has been identified, the student and faculty advisor fill out a Dissertation Committee Recommendation form (see Graduate College forms [here](#)) and submit it to the Graduate College, with a copy to the Graduate Coordinator. For details concerning selection and recommendation of the Dissertation Committee, also see NAU’s [policy for theses and dissertations](#).

The first meeting between the student and their graduate committee must be held before the end of the student’s third semester. Students are encouraged to form their committee and hold their first committee meeting as early in their graduate career as they feel is appropriate. Unless advised otherwise by their primary advisor, committee meetings must be scheduled by the student each semester thereafter to discuss progress, get advice on any difficulties encountered, and solicit feedback.

A student may change the personnel on their committee at any point, but this change should be carefully considered and must be approved by the student’s primary advisor, the Department Chair, and the Graduate College. In the event of a committee change, a new dissertation committee form must be submitted to the Graduate College. Examples of when committee membership changes might be appropriate include: a current committee member retiring or leaving NAU/Flagstaff, the arrival in Flagstaff of an individual who brings new expertise and is a better match than an existing committee member, a switch of primary advisor, or a significant shift in research emphasis that suggests that a different set of expertise on the committee might be a better match for the student’s research program.

Research

By the time students leave this PhD program, they will be a leading expert in their research topic. Typically, students take around five years to develop this expertise (although shorter or longer periods are permitted with approval of the primary advisor and dissertation committee).

Finding a Primary Advisor and Research Project

Some students will enter the program with a clear idea of what area of astronomy and planetary science they want to work in and an agreement with a faculty member to work together. In this case, that project will form the foundation of the student's primary research project and that faculty member will serve as the student's primary advisor and dissertation committee chair. This is a common path, for example, when students enter the program as a GRA.

Other students might enter the program with a general sense of their area of interest ("planetary geology" or "telescopic observations") which still might leave a wide range of specific topics to work on and a number of different faculty who might appropriately serve as their primary advisor. This may be a common path for students entering as a GTA, for example.

While finding a primary advisor is often an organic process, a first step towards finding this advisor should be a review of the research interests of DAPS faculty, Lowell Observatory astronomers, and local USGS scientists. The student is then encouraged to read recent publications from faculty, astronomers, and scientists whose work is of interest to the student. Following this literature exploration, the student should have a "short list" of local scientists who could be a good fit as a primary advisor. The student should then schedule meetings to talk with potential advisors on their short list in order to refine their interests and start to develop a research direction. Here, students are also encouraged to visit different lab group meetings, talk to current students and, when possible, try small-scale research projects to get a sense of what research in that area and with that advisor would look like. In some cases, the potential advisor will have small-scale projects ready for a student to undertake. In other cases, significant discussion will be needed to find research areas that are interesting to both the student and potential advisor, and are reasonable and interesting research projects. It is appropriate and important to discuss funding and support with a potential advisor, as potential advisors are not obligated to provide funding. By the end of their second semester, all students should have identified a primary advisor and be in the process of defining the research topic that will eventually be the student's PhD dissertation.

Research Rotation

Students are required to engage in a research rotation under the guidance of a separate advisor (i.e., distinct from their primary advisor). For students entering *without* a well-defined primary advisor or dissertation topic, research rotations will be used, in part, to explore dissertation project ideas. Here, the student must complete two distinct rotation-like projects by the time research rotation products are due (see below; one project is selected as the formal rotation project).

The goal of a research rotation is to help the student build complementary skills to those developed as part of their dissertation work and to expose the student to other areas of astronomy or planetary science. Thus, the rotation is conducted with a different researcher and on a topic that is different from their dissertation topic. The rotation project is likely to be smaller than the dissertation project (though it need not be). The minimum scope of a rotation is a one semester, three credit project — around 10 hours/week for 15 weeks. While carrying out this rotation, students should register for three credits of AST685 under their rotation supervisor's name. In some cases, the rotation project may continue beyond the scope of one semester, depending on mutual interest with their research supervisor, and eventually become a mature part of the student's dissertation. The rotation advisor may be a good person to consider for membership on the dissertation committee, though that is not a requirement.

Students must select/declare their rotation project by their third semester. All students will give a 10-15 minute presentation on their rotation work by the end of their fourth semester. This talk should be in a typical conference style, with a brief introduction to the problem, an overview of the methods used, results, and discussion/conclusions. It is not expected that all rotation projects have concrete and/or publishable results, and it is acceptable for the results section of the student's talk to cover new skills that were learned during the rotation. Finally, students must submit an LPSC-style abstract on their rotation work by June 1st of their second year (see template [here](#)). Students who fail to complete their required rotation project according to this timeline are subject to academic probation (as defined below; although the GPC may grant exceptions under special circumstances).

Comprehensive Examinations

The written and oral comprehensive examinations (sometimes referred to, collectively, as the Qualifying Exam) are designed to assess the student's breadth and depth of knowledge in astronomy and planetary science as well as their analytical ability, innovation, and critical thinking skills. Upon successful completion of both comprehensive exams, the student is considered qualified to proceed into the intensive research phase of their degree program that ultimately leads to their PhD dissertation and defense. Both the written and oral comprehensive examinations must be passed (with any conditions met) in order for the student to advance to candidacy. A student making satisfactory progress is expected to have completed both

segments of the comprehensive examination by the end of their fifth semester. Failure to complete both comprehensive examinations by the end of the fifth semester will result in the student being placed on academic probation. Cases where exceptional circumstances exist that prevent the student from completing their examinations by the end of their fifth semester will be considered on a case-by-case basis by submission of a petition to the GPC upon approval by the primary advisor and dissertation committee.

Written Comprehensive Examination (Prospectus)

The written comprehensive examination consists of a written prospectus detailing the student's proposed dissertation topic. The purpose of the prospectus is to demonstrate that the student's research has high scientific merit and that the proposed work is of an achievable scope.

The prospectus should be no more than 15 pages in length, exclusive of references (single-spaced, 12 point font size, Times New Roman or similar font, 1 inch margins on each side). Citations and references should be in a format that is appropriate to the primary sub-field of the project. The prospectus should be written in consultation with the primary advisor (and any co-advisors, if relevant), but it must be the student's own work. The student should also seek feedback on writing style and/or content from other graduate students in the program, especially those who have successfully passed their Qualifying Exams.

Generally, this prospectus should motivate the research project with an appropriate literature review, culminating in a statement of the science hypotheses or goals of the proposed work. The prospectus should also include a detailed description of the methodology to be used (which can include a description of work completed to date) as well as anticipated results. More specifically, and following the NAU Graduate College [Thesis and Dissertation Committee Roadmap](#), a successful prospectus should contain: (1) a clearly-defined statement of a key problem (or problems) in the field, (2) a precise description of the research questions (and/or hypotheses, if applicable) that will be used to address the key problem(s), (3) demonstration of viable, well-scoped methodologies to address the research questions (and/or test stated hypotheses), (4) a focused and appropriate literature review, and (5) a complete bibliography that demonstrates adequate understanding of the field. Finally, the prospectus should include (within the 15-page limit) a timeline that covers significant degree and professional milestones as well as the remaining dissertation work. To this end, the prospectus should be written such that the committee can assess the intellectual merit of the proposed work, the applicability of the proposed methods, and the utility of the anticipated results, as these apply to the enumerated criteria above. At least three-fourths of the dissertation committee, including the primary advisor, must vote in favor of passing in order for the student to successfully pass the written comprehensive examination.

The written comprehensive examination must be successfully approved prior to scheduling the oral comprehensive examination. If the student fails the written comprehensive exam, they are placed on academic probation. A second attempt at the written comprehensive exam must

occur within six months; in this case, the consequent delay in the oral exam is acceptable and the student will not be penalized for taking their oral exam after their fifth semester. The outcome of the written comprehensive exam is recorded on the Report of the Results of Written Comprehensive Examination form which can be found in the [department forms index](#). Here, the committee provides feedback on the prospectus to the primary advisor who then summarizes these comments for the student in advance of the oral comprehensive exam via the department form.

A grade of “pass with conditions” can be assigned to the written comprehensive examination. Such a grade should be used when most portions of the written examination are acceptable but limited portions of the document do not meet the passing criteria outlined above. The conditions for passing are then limited to only making revisions to the limited portions of the document that were identified as requiring substantial improvements. The timeline to meet the conditions should be agreed upon by the committee and student, should not be shorter than one month, and should not exceed three months. If the committee feels like the timeline needs to be longer than three months, then the grade is “fail.” The oral exam cannot be scheduled until all conditions are met.

If the student fails the second attempt at the written comprehensive examination, they may petition the Graduate Program Coordinator or GPC to review the exam outcomes via the grievance process described below or, if the appropriate requirements are met, the student may exit the program with a terminal (“fallback”) masters degree. If the student does not meet all of the appropriate requirements and conditions of passing, the student will be dismissed from the program with no degree awarded.

Oral Comprehensive Examination

The oral comprehensive examination provides an opportunity for the student to display their knowledge about astronomy and planetary science and their research topic. The student will be evaluated on their understanding of the field and ability to bring together ideas and present them cogently in an oral format. The student will also be evaluated on their knowledge of the proposed research project and their preparedness to carry out the remaining work. The oral examination is administered by the student’s dissertation committee, is closed-door, and lasts up to three hours (for all components, including committee deliberation). It can only be taken after the student has successfully passed the written comprehensive examination. The timing between written and oral exams is not codified, but is usually several weeks. The faculty advisor will organize and direct the examination, which includes the following aspects:

- A 20-30 minute presentation by the student of the research topic, discussion of the question to be addressed, and the methodology by which the research will be conducted.
- Questions related to the research.

- Questions on other relevant topics, including questions related to coursework completed by the student as well as basic knowledge in astronomy and planetary science.

The depth and breadth of questions from the committee should generally reflect the student's research topic. The student is expected to have detailed knowledge of topics that are essential to carrying out the proposed work as well as competence on topics that are more tangential or conceptual. The primary advisor is responsible for ensuring that the oral exam is conducted in a fair and appropriate manner. After the student has finished their presentation and has addressed all questions from the committee, the student will be asked to leave the room but to remain nearby. The faculty advisor will then lead the discussion among the committee regarding the student's performance on the oral comprehensive examination. The members of the dissertation committee will individually and collaboratively assess the student's performance and will assist in constructing the student's final evaluation.

The potential outcomes of the oral exam are "pass," "pass with conditions," and "fail." A majority of the committee must agree on the assigned grade. After an outcome has been decided by the committee, the student is asked to return to the room to be debriefed on their performance. The committee will also provide written feedback to the student within a week of the oral exam. This memo must be approved by the committee, signed by the primary advisor (and secondary advisor, if applicable), and also signed by the student.

A grade of "pass" means that the student is prepared to undertake their dissertation research. A grade of "pass with conditions" means that the student is generally prepared, but that a significant weakness was (or weaknesses were) identified in the student's preparation, and the committee requires the student to address this weakness. The conditions that are applied will be commensurate with the perceived weakness and could, for example, include taking a class to reinforce some key material, giving a brief presentation on a topic to the dissertation committee within a specified number of months that demonstrates mastery of an important subject, or similar requirement(s). The goal of these conditions is to provide the student an opportunity to demonstrate topical or skill competency to the dissertation committee in the event that there is a significant weakness in the student's performance. The specific condition(s) will be noted on the Comprehensive Exam Form (see DAPS forms [here](#)), as well as both the requirements and the timeline to meet the conditions specified (which should generally be less than two semesters). The student is permitted to negotiate an acceptable timeline. Once the conditions are met, the advisor and student complete the Comprehensive Exam Form again, indicating "pass." If the conditions are not met within the timeline, then the student is placed on academic probation and will have one additional semester to meet the conditions. If the conditions are not met within that additional semester, then the grade reverts to "fail" (barring exceptional circumstances, as handled via the grievance process described below).

A grade of "fail" means that the student did not demonstrate their readiness to complete PhD-level work on the topic proposed. If the student fails the Oral Comprehensive Examination, they are placed on academic probation and a second attempt may be scheduled within six

months. If the student fails the second attempt at the Oral Comprehensive Examination, they may petition the Graduate Program Coordinator or GPC to review the exam outcomes (via the grievance process described below) or, if the appropriate requirements are met, the student may exit the program with a terminal (“fallback”) masters degree. Otherwise, the student will be dismissed from the program with no degree awarded.

Results of the oral examination must be reported to the Graduate College on the “Report of Results of Oral Comprehensive Examination” form found in the [Department forms index](#).

Admission to Candidacy

The student must apply to become an official candidate for the PhD degree after the successful completion of the written and oral comprehensive examinations. The student must successfully complete any conditions before applying for candidacy. Candidacy implies that the student is prepared to undertake an individual research program and write a dissertation.

The student must complete and submit the [Candidacy Application Form](#) to the Graduate College. Admission to candidacy requires:

- Confirmation of completion of a professional development activity, or activities, totaling more than five hours of student time.
- Successful completion of the written and oral comprehensive examinations, including completion of any/all conditions from both examinations.
- Completion of all course work on the Program of Study approved by the faculty advisor, dissertation committee, and Graduate Coordinator. This includes removal of course deficiencies specified by your committee.
- Approval of prospectus as indicated by the signatures of all dissertation committee members on the title page.

Seventh Semester Research Talk

Students in their seventh semester will give a science talk (potentially during a DAPS regular colloquium slot). Nominally this talk will be a 20-25 minute oral presentation on the student’s primary research topic. The goals of this colloquium are: (1) to give students practice at presenting their research (2) to give students practice in giving a talk that is longer than a standard conference presentation and (3) for members of the department to learn what the student is working on. The talk format should follow a standard, but abbreviated, colloquium format. Here, roughly 5 minutes would be dedicated to relevant background information and motivation. Then, 5–10 minutes would be spent describing the student’s research approach (e.g., laboratory techniques, datasets, tools) followed by 5–10 minutes of results, preliminary results, and/or expected results. A remaining 5 minutes would be spent connecting the results to the bigger-picture questions and ideas raised during the introduction and motivation. Roughly 5 minutes should be reserved for audience questions and speaker changeover (if relevant). Students should solicit feedback on their presentation from their primary advisor, and talk

attendees will be asked to provide review-style feedback to the student (i.e., no personal attacks or criticisms) that helps to improve talk structure and communication techniques.

Dissertation Requirements

Dissertation Document

Information about dissertation requirements can be found on the Graduate College [Theses and Dissertations website](#). Please follow the “Checklist for Doctoral Students” to ensure meeting all requirements. Note that the student needs to submit the graduation paperwork in the semester prior to the one in which the student plans to graduate. The Thesis and Dissertation Coordinator of the Graduate College is a critical source for all current thesis requirements, including format, style, deadlines, and the “format check.” Note that all Theses and Dissertations are submitted electronically. A “format check” by the Graduate College assures that the document is being prepared such that the final copies will be acceptable to the Graduate College. The “format check” is required and can prevent lengthy delays to completion of a degree.

Two types of dissertation formats are accepted. In the first type, the dissertation is a complete work, and has a coherent narrative arc that typically includes an introduction, methodology, data, analysis, results, discussion, and conclusions. In the second type, the dissertation consists of chapters containing peer-reviewed publications by the student on the work, but must also include additional introduction and conclusions chapters that tie the publication results together. There is no formal publication requirement for graduation, and a dissertation can also be a combination of the two above types. The student and dissertation committee must agree upon the choice of the specific format. The amount of work presented in any dissertation type is not different.

The following list provides guidelines for completion of the dissertation:

- The faculty advisor must review the completed dissertation prior to submission to the entire dissertation committee. The student is expected to revise the dissertation based on the faculty advisor’s comments and resubmit it to the faculty advisor—this revision may require multiple iterations until the faculty advisor deems the dissertation ready to be submitted to the dissertation committee, (i.e., submit completed dissertation document to the faculty advisor at least eight weeks prior to the dissertation defense).
- Submit the dissertation electronically to the Electronic Thesis and Dissertation (ETD) Coordinator (etd@nau.edu) for format review. This submission should be done in the first two or three months of the semester in which the student plans to graduate, but no later than three weeks prior to the defense. The format check cannot be completed during the last two weeks of the semester or in the period between semesters. The format check will typically take five to ten working days for completion and needs to be done before the final defense. This check can occur concurrently with chapter review

and approval by the advisor and committee. See the [ETD Format Checklist](#) for specific information on the university requirements.

- After all chapters have been reviewed and approved by the faculty advisor, the student will provide the full dissertation to the entire dissertation committee at least three weeks prior to the dissertation defense examination date. If a committee member determines that the dissertation is inadequate, they may return it to the student with requested revisions no later than two weeks prior to the defense and notify the faculty advisor of their concerns. Under extreme circumstances, the student, advisor, and committee member may need to discuss a delay of the defense. Students are expected to carefully consider the comments of their dissertation committee. The faculty advisor has the responsibility to ensure that the recommendations of the dissertation committee have been addressed in the revised dissertation. The faculty advisor has final responsibility for dissertation approval.
- Work with the faculty advisor and dissertation committee to schedule the date, time, and location of the dissertation defense examination. Note that the defense cannot be scheduled within two weeks of the end of the term. The faculty advisor must submit the dissertation defense scheduling form to the Graduate College ETD Coordinator at least 10 working days prior to the defense. This requirement is a strict deadline and can result in needing to reschedule the defense if the deadline is missed. A copy of the completed dissertation must also be submitted to the ETD Coordinator at this time to be passed on to the faculty member representing the University Graduate Committee at the defense. (This UGC faculty member will be someone from outside the discipline and serves to ensure uniformity of defenses across campus. This person will be assigned, or self-assign, to the defense, and the student and advisor have no control over who it will be. This UGC representative is never involved prior to the defense, and is usually only very marginally involved during the defense.)
- Students must register for at least one credit of dissertation (AST799) for each semester after and during the defense until a final copy of the thesis is submitted to the Graduate College. As a result, summer defenses are discouraged because summer GRA appointments seldom include tuition funds/waivers.
- The final dissertation must be submitted to the Graduate College at etd@nau.edu after approval by the dissertation committee and a successful final defense.

Dissertation Defense

A final dissertation defense is required of all Ph.D. students. The student must work with their faculty advisor and dissertation committee to schedule a date and time for the final defense. All members of the dissertation committee must participate in the final defense. If a committee member is unable to attend in person, arrangements must be made for that person to participate via Skype, Zoom, WebEx, or some other method. The student is responsible for reserving the room for the final defense with the department office staff. The room will need to be reserved for a four hour time period. The student must provide the department office staff with the dissertation title, a short abstract of the presentation, and the date, time, and location of

the defense at least two weeks prior to the defense so the public presentation portion of the examination can be advertised to faculty and students.

The dissertation defense examination consists of two components: a presentation and an oral examination. The presentation component is open to all faculty, students, staff, and public. During this portion of the exam, the student orally presents an overview of the objectives, methods, results, and implications of the thesis research. The presentation is expected to last approximately 45 minutes. Questions from the audience are permitted within a 15-minute period following the presentation. The presentation portion of the final defense will not exceed 60 minutes. All members of the audience who are not on the dissertation committee or representing the University Graduate Committee (UGC) are required to leave the room following the presentation.

The oral examination by the dissertation committee and UGC Representative will start immediately after the presentation once the room has been cleared of all other audience members. This portion of the examination will usually last at least 60 minutes and will not exceed 120 minutes. The faculty advisor and UGC Representative have the responsibility to ensure that the examination is conducted in a fair and appropriate manner. Dissertation committee members will take turns directing questions to the student. Questions will be limited to the dissertation research or to general knowledge related to the dissertation. Extended and detailed answers are expected from the student in response to the questions. Oral examination questions are designed so the student can demonstrate their ability to integrate and apply information gained from coursework and the dissertation research project.

Once the dissertation committee has completed their questioning of the student, the student will be asked to leave the room but to remain nearby. The faculty advisor leads the discussion of the student's performance on the presentation and oral examination. Following the discussion, the dissertation committee will vote on whether to pass or fail the student. A majority vote of the committee is required for the student to pass. The UGC Representative collects the ballots, tallies the results, and records the official vote. The dissertation committee must fill out the Thesis/Dissertation Oral Defense — Part 1 Form to record and document the vote. This form can be downloaded by either the faculty advisor or the UGC Representative and brought to the defense (see Graduate College forms [here](#)). The UGC Representative and/or faculty advisor records the vote results and any required changes or other requirements that must be completed prior to final acceptance of the thesis. All dissertation committee members must sign the document according to form rules. If a committee member is not able to sign the form, they must give permission for the UGC Representative or faculty advisor to sign for them. The UGC Representative or faculty advisor submits the form to the Graduate College within 48 hours after the defense.

The student is called back into the room by the faculty advisor to learn if they passed or failed. The dissertation committee will debrief the student on their performance and discuss what revisions are required before the thesis will be accepted as final. If the student fails the first

defense, the student will be placed on academic probation and will be given another opportunity to defend. The second defense should be scheduled within six months of the first defense. If the student fails the second defense, they will be dismissed from the program with no PhD degree awarded.

Once the student has completed final revisions to the dissertation, the faculty advisor fills out and signs the Verification of Final Thesis/Dissertation Document — Part 2 Form (https://nau.edu/graduate-college/wp-content/uploads/sites/14/Final_Oral_Defense_Form_Parts_1and2.pdf) and submits it to etd@nau.edu. The student must submit the final version of the dissertation with all revisions to the Graduate College on the [NAU EDT website](#) no later than two days prior to the last day of term. The student is also required to fill out and submit the Survey of Earned Doctorates (SED) form, whose link is provided within the NAU ETD website.

Application for Graduation

The Graduate College announces its deadlines for filing an Application for Graduation on its [graduation website](#) at the start of each academic year. Applications for graduation must be submitted at least one semester prior to when graduation is expected. Relevant documents and instructions are available in the [forms section of the Graduate College website](#).

Dissertation and Defense Timeline

A general timeline with major milestones for a dissertation and defense should follow:

Semester prior to defense:

- Submit Application for Graduation. ([link](#))
- Enroll for appropriate 799 credits.

Semester of defense:

- Enroll for appropriate 799 credits.

Ten business days prior to defense (at least):

- Electronically submit dissertation to [ETD Coordinator](#). Follow formatting rules. ([link](#))
- Submit Dissertation Defense Scheduling form. ([link](#))
 - Note that defenses cannot occur within two weeks of the end of term.

Day of defense:

- Committee completes Oral Defense Form: Part 1. ([link](#))

Following defense:

- Committee completes Oral Defense Form: Part 2 once revisions completed. ([link](#))
 - Must be submitted before the Registrar's end-of-session date for the term.
- Electronically submit accepted dissertation to ProQuest. ([link](#))
- Complete Survey of Earned Doctorates. ([link](#))

Masters Degrees

The department maintains a Masters of Science degree in Astronomy and Planetary Science available to all enrolled PhD students. Non-PhD students cannot apply to, or enroll for, this degree. Following Graduate College terminology, this degree can be awarded either en route to the PhD (“in-passing”) or to students who are leaving the program prior to the awarding of their PhD (“fall back”).

The Astronomy and Planetary Science masters degree has coursework, research, and presentation requirements. The coursework requirement largely mirrors the courses PhD students take in their first two years, and includes the following 30 units:

- AST 501, AST 502, AST 550, AST 570 (12 units), and
- Additional AST or other graduate coursework appropriate to your research plan and approved in consultation with your coordinator. At least 3 units must be research courses, and at least 12 units of formal graded coursework. (18 units)

The research requirement is the delivery of any one of the following products: (1) a submitted first-author paper; (2) a research rotation LPSC-style abstract submitted to the GPC; (3) a committee-approved written prospectus; (4) a significant contribution to a submitted manuscript, as certified by both the lead author and primary advisor; or (5) a research publication or tool that the PhD committee and GPC agree is an acceptable product.

A presentation requirement for the masters is any one of the following: (1) an oral presentation at a professional conference; (2) a departmental presentation open to a general audience beyond the student’s local research group (e.g., a department colloquium or mini-colloquium); or (3) an oral presentation that the PhD committee and GPC agree is an acceptable product.

The acceptability of a research product and presentation must be verified by the GPC via an informal email exchange with the GPC Chair.

Evaluations, Timelines, and Milestones

Annual Evaluations

Each student is required to complete an annual evaluation, which includes both a self evaluation and a faculty advisor evaluation of the student. The goal of this document is to encourage student self-reflection on achievements in the past year, and to motivate the student to look ahead for realistic but ambitious goals for the coming year. Detailed instructions are provided in the annual evaluation form ([link](#)), and the student and primary advisor are encouraged to work collaboratively on both the future goals and faculty evaluation sections. Annual review forms are reviewed and documented by the GPC and Department Chair.

The student self evaluation (1) provides information to the GPC to enable tracking of progress through the PhD program, (2) allows the student to engage in a regular goal setting exercise (in consultation with the primary advisor), and (3) empowers the student to reflect on accomplishments from the previous year (including, but not limited to, teaching activities, research progress, coursework completed, and outreach activities). The self evaluation includes brief details on advancement towards the student's degree as well as student-provided information on metrics that help the Graduate Program Committee gauge the student's professional progress. The student provides a self evaluation narrative (no more than two pages) that describes activities in the previous year. Also, the student provides a short (no more than one page) discussion of progress made toward the previous year's goals. Finally, the student describes goals for the coming year. Annual evaluations are due September 15 of each year unless the Graduate Coordinator specifies a different deadline.

Once finalized, the primary advisor uses the student's self evaluation to (1) provide an evaluation of progress and (2) assign a progress grade. The progress evaluation should be mindful of the prior year's collaboratively-set goals, should acknowledge how students may have overcome unexpected hurdles, and should consider if the advisor worked together with the student to help achieve goals and overcome setbacks. Progress grades for the student are limited to "progressing," "needs improvement," and "not progressing." The grade of "progressing" means that overall the student is making appropriate progress through the PhD program. The grade of "needs improvement" means that the student is making some progress, or progress in some areas, but that overall the student's performance does not meet the expectations of our program in an appropriate time frame. The grade of "not progressing" indicates serious deficiencies in the student's work that need to be addressed. For grades of "needs improvement" or "not progressing," specific areas for improvement will be identified by the advisor and Graduate Program Committee. A student who receives a "not progressing" grade will be placed on academic probation.

The primary advisor should share their evaluation with the student for feedback and/or discussion prior to formal submission to the GPC. Faculty evaluations are due to the GPC by October 15 of each year.

Pre-exams students, and any post-exams students who receive a progress grade of either “needs improvement” or “not progressing,” will be provided a less-formal mid-year evaluation from the student’s primary advisor. This mid-year evaluation is intended as a check on progress towards goals stated in the annual self evaluation.

Students and advisors are encouraged to meet and discuss faculty evaluations. Students who wish to respond to their faculty evaluation may do so in writing via the final page in the evaluation form. Such responses must be returned within two weeks of receipt of the faculty evaluation. In the case that a student does not wish to formally respond and only wishes to clarify some aspect of their performance, they may email the Graduate Program Committee which will read the reply and file it alongside the original evaluation. If the student response includes a challenge of their assigned progress grade, the Graduate Program Committee will consult with the student, the student’s advisor, and Department Chair to arrive at a potentially-revised grade within two weeks. Students may meet with the advisor, Graduate Program Committee, and/or Department Chair to discuss grade revisions at any point during this process.

Annual Evaluation Calendar

September 15: [Student annual self-evaluation](#) due.

October 15: Semesterly faculty evaluation provided to students.

April 15: Semesterly faculty check-up provided to pre-exams students.

PhD Program Milestones

The timeline below is meant to suggest a nominal path through the program, but many students may have different timing. If the student has any questions, please talk to an advisor, the dissertation committee, and/or the Graduate Program Committee. A draft timeline chart showing these milestones can be found at this [link](#). Students are also encouraged to follow the Graduate College’s Checklist for Doctoral Students (see the Graduate College [forms page](#)).

Semester 1: Start program.
 Meet Graduate Coordinator and Graduate Program Committee.
 Begin identifying research rotation project(s).
 If entering without a primary advisor, meet faculty and discuss research ideas.

Semester 2: Continue to develop primary research topic and plan.

Finalize research rotation advisor and project.
 Finalize primary advisor (and faculty advisor, if required).
 Complete Program of Study (submitted later with candidacy paperwork; [link](#)).

Semester 3: Meet with Graduate Coordinator and/or Graduate Program Committee.
 Finalize dissertation committee.
 Continue to develop primary research topic and plan.
 Continue research rotation project.
 Submit Recommendation of Dissertation Committee to Graduate College ([link](#)).

Semester 4: Continue to develop primary research topic and plan.
 Presentation of research rotation.
 LPSC-style write-up of rotation project due.
 Finish coursework requirements (normally).

Semester 5: Meet with Graduate Coordinator and/or Graduate Program Committee.
 Finalize primary research topic and plan.
 Written comprehensive exam (i.e., prospectus).
 Oral comprehensive exam.
 Complete departmental Comprehensive Exams form ([link](#)).
 Submit Candidacy Application form to Graduate College ([link](#)).

Semester 6+: Annual meet with Graduate Coordinator and/or Graduate Program Committee.
 Apply for residency for tuition purposes (recommended) (Semester 6; [link](#))
 Seventh semester research talk (Semester 7)
 Continuous progress on primary research topic, including papers and talks.
 Write/accumulate dissertation.
 Defend (Semester 10, usually; see separate [Dissertation & Defense Timeline](#)).

Academic Probation

A student can be placed on Academic Probation for issues related to failing to make progress through the PhD program (detailed throughout this document). The purpose of Academic Probation is to inform a student and their committee of areas of weakness in the student's progress through the program. A key outcome of notifying these parties will be the development of a sustainable plan to mitigate these progression weaknesses. The student's advisor(s) and dissertation committee will work with the student to build this plan and to consider the unique and individual circumstances of each student's academic situation. Under extenuating circumstances (e.g., medical leave of absence, parental leave), the Graduate Program Committee may agree to modify the definition and implementation of Academic Probation to best accommodate a student and ensure success. Unless otherwise noted here, Academic Probation within the Department of Astronomy and Planetary Science will follow all rules and

guidelines established by the Graduate College ([Policy No. 100319](#)). The process of academic probation is separated from graduate research or teaching assistantship hiring (and the stipend and benefits associated with these assistantships).

The student will be notified of probation in writing (by email) by the Graduate Coordinator; relevant advisor(s) and Department Chair will be informed as well. The student, advisor(s), dissertation committee, and Graduate Program Committee will then work together to develop an "Improvement Plan," which specifically states what the student must do to be removed from probation (including relevant deliverables/outcomes and timelines/milestones). This improvement plan will be signed by the student, relevant advisor(s), the Graduate Coordinator, and the Department Chair.

With the exception of students who earn below a GPA of 3.0 in any given semester, Academic Probation is omitted from students' transcripts and is meant to remain internal to NAU, the Graduate College, and the Department of Astronomy and Planetary Science. Students on Academic Probation for two consecutive semesters may be asked to leave the graduate program if the Graduate Program Committee agrees that the Improvement Plan remains unfulfilled. Students who are placed on Academic Probation for three total semesters are no longer eligible to progress through their graduate studies. The recommendation for dismissal must follow the procedures outlined in NAU [Policy No. 100319](#), and students may appeal this recommendation following the procedures outlined in NAU [Policy No. 100103](#). If a student is dismissed from the program due to Academic Probation (as above) there will be no option for a terminal Master's degree.

Students placed on Academic Probation will have an additional committee member assigned to their dissertation committee. This assignment will be made by the Graduate Program Committee, and will be a member of the Graduate Program Committee or, if all members of the Graduate Program Committee are already on the student's committee, the Department Chair or Associate Department Chair. The role of this additional committee member is to provide an independent mediator and to promote student success. The dissertation committee (with input from the Graduate Program Committee) will then define an Improvement Plan that must be satisfied by the student before the end of the following semester (to avoid the consequences outlined above). Examples of possible improvement requirements include: (1) additional coursework; (2) a literature review; (3) an improved GPA; or (4) completion of the student's comprehensive exam. If the student satisfies the Improvement Plan, they will be removed from Academic Probation. If the student fails to satisfy the Improvement Plan by the end of the assigned semester, the student will remain on Academic Probation (at which point the Improvement Plan may be revised). The Improvement Plan will be agreed upon by the student, relevant advisor(s), and the Graduate Coordinator before final approval by the Department Chair (as mentioned above).

Students may be placed on Academic Probation for any of the following reasons. Please note that these reasons are determined by the NAU Graduate College (see aforementioned Policy

No. 100319). Where there is disagreement between the policies of the Graduate College and the Department of Astronomy and Planetary Science, the departmental policies override those of the Graduate College.

- Failure to maintain *Good Academic Standing*, which is defined as earning one "D," one "F," or two "C's" on any course(s) they are taking towards their graduate program of study, or having their cumulative GPA drop below 3.0.
- Failure to make sufficient *Academic Progress*, as determined by the student's dissertation committee. This is defined in NAU Policy No. 100319 as failure to:
 - [make] satisfactory progress in research, scholarship, or creative activity,
 - [complete] the program elements within specified time limits, and/or
 - [pass] required program examinations.
- Not satisfying conditions stated in their Semester Evaluation:
 - Receiving a mark of "Not Progressing," or
 - Failure to satisfy the conditions set forth in the previous Semester Evaluation as a result of a grade of "Needs Improvement."
- Not satisfying the requirements for completion of the research rotation:
 - Failure to complete the rotation write-up at the end of the student's fourth semester, or
 - Failure to present the oral component of the rotation by the end of the fourth semester.
- Not satisfying the requirements for completion of their Comprehensive Exam:
 - Failure to pass either their written or oral exam prior to the end of the fifth semester,
 - Receiving a mark of "Fail" on their Comprehensive Exam; or
 - Failure to satisfy the conditions set forth in order to satisfy a mark of "Pass with Conditions."

Other Policies and Resources

Forms

A collection of Department of Astronomy and Planetary Science forms can be found [here](#). Please send suggestions for forms/policies that should be added to the Graduate Program Committee.

Leave of Absence Policy

Graduate students in degree programs that require continuous registration may be granted a Leave of Absence for up to one academic year by the Associate Dean of the Graduate College, upon the recommendation of the student's Faculty Advisor and the Department Chair. The

Leave of Absence form is available from the Graduate College (see [here](#)). A leave will be granted under conditions requiring the suspension of activities associated with the thesis/dissertation or coursework. A leave will be granted for extraordinary reasons only. Normally, time-to-degree requirements are not suspended during a Leave of Absence — if an extension of time to degree is needed, it should be requested in the Leave of Absence form. The right to use University facilities and/or faculty time is suspended during a Leave of Absence. No form of graduate assistant support will be provided during the Leave of Absence.

International students (students attending NAU on an F-1 or J-1 visa) are generally not eligible for a Leave of Absence due to federal regulations. Contact the [Center for International Education](#) for any exceptional circumstances or questions.

Leave of Absence requests must be filed no later than the last day for adding classes during the semester in which the leave is to start and cannot be granted retroactively. Students on an approved Leave of Absence will not be required to apply for readmission. Students who are absent beyond the end of an approved Leave of Absence may be required to apply for readmission as a graduate student and to the appropriate academic department. A Leave of Absence will be extended beyond one year only under exceptional circumstances. Such an extension must be requested on the Leave of Absence form.

Other Resources

All parts of the university are dedicated to student success, and students are encouraged to seek out any help they may need. A partial list of resources available to students within the department includes other students; faculty advisor; other members of the dissertation committee; the Graduate Coordinator; the Graduate Program Committee; and the Department Chair and Associate Chair. Furthermore, the department's faculty members care about the success of all graduate students, so students are encouraged to seek out any faculty member for discussions related to science, professional development, and/or any difficulties encountered in professional or personal life.

Outside of the department there are a number of resources available to students as well. Where possible, students should talk with intra-department resources before consulting with extra-department resources, in the interest of full communication.

The [Graduate College](#) is a strong advocate for graduate students on this campus. Questions about bureaucratic issues should go to the appropriate Graduate Coordinator and/or Graduate College staff (see [here](#)), who are very friendly, knowledgeable, and helpful. Questions or issues of a more substantive nature should go to the Associate Dean or Dean of the Graduate College. Both are dedicated to helping students, but please recognize that they have very large constituencies across campus, so should generally only be approached if all department resources have been exhausted, or if department resources cannot be consulted for a specific reason.

Students may also want to work with the Graduate Student Government ([GSG](#)), which advocates to university administration to represent the needs of graduate students; there are elected GSG positions that students in our department may choose to run for. The university also maintains a formal system (see [here](#)) for anyone on campus who has a complaint or issue that cannot be handled directly through the chain of command.

The NAU Human Resources ([HR](#)) department can be consulted if there are workplace issues. The NAU Equity and Access Office ([EAO](#)) can be consulted if there are equity or access issues. On issues of inclusivity, diversity, and equity, contact the NAU Office of Inclusion ([link](#)).

Finally, NAU Campus Health Services ([link](#)) has a wide range of services available to students, including well visits, sick visits (though emergencies should proceed to an emergency room), and mental health counseling.

Mediation, Grievance, and Appeal Procedures

Students who experience difficult situations of any nature (interpersonal relationships, workplace safety issues, student-advisor communication or working relationship complaints, or any other issue) are encouraged to work with faculty to solve the issues. The general approach is that the student should document (in writing) the complaint and follow the [Graduate Assistantship, Traineeship, and Fellowship Policy Handbook](#) procedure for a reporting order/hierarchy: primary advisor; department Graduate Coordinator and/or Graduate Program Committee; Department Chair; Associate Dean or Dean of the Graduate College. If the student does not feel comfortable at one level of the reporting structure that level may be skipped (example: student/mentor relationship makes student feel uncomfortable so student proceeds to the Graduate Coordinator).

Mediation of difficult situations is available, encouraged, and can be requested through the Graduate Coordinator or Graduate Program Committee. For example, if a student-advisor relationship is strained or challenging, either party can request a Graduate Program Committee member to help mediate the situation; student-student difficulties can also be mediated. While students and faculty are encouraged in all cases to privately discuss problems and look for solutions, either party can request mediation.

Grade appeals will be treated as described by NAU [Policy No. 100105](#).

All other appeal procedures are described in the NAU catalog or in the NAU student handbook. Please consult with an advisor, the Graduate Coordinator, the Graduate Program Committee, or the Department Chair with any questions.

Reporting Fraud or Ethical Violations

The university provides many ways to report misuse of NAU resources or ethical violations. Documentation of what constitutes misuse of NAU resources or ethical violations is specified in the [NAU Student Code of Conduct](#), [NAU Graduate Handbook](#), [NAU Misconduct in Research Policy](#) (currently being revised), and the NAU [Academic Integrity Policy](#). These include:

- reporting a concern to your supervisor,
- contacting [NAUPD](#) (928 523-3611),
- contacting [Human Resources](#) (928 523-2223),
- contacting [Internal Audit](#) (928-523-6438),
- contacting [Financial Compliance, Analysis and Reporting](#) (928 523-6081), or
- completing a [Report of Ethical or Internal Control Concern](#).

Feedback and Review

Feedback on this handbook or on any aspect of the graduate program is welcome. Feedback can be provided to an advisor, the Graduate Student Representative to the Faculty, the Graduate Coordinator, the Graduate Program Committee, and/or the Department Chair. If possible, the Graduate Program Committee and/or Graduate Student Representative should be CC'd on communications to help ensure accountability. Formal review of this document by the Graduate Program Committee and Graduate Student Representative should occur at least once every year.

Change & Review Log

v1.1	Updated student evaluation section to align with evals form [TDR]	08/23/2021
v1.1	Removed old residency language; added pro dev requirement [TDR]	08/23/2021
v1.1	Clarified language on passing/failing oral/written exams [TDR]	08/18/2021
v1.1	Updated PHY 530 to AST 550 [TDR]	05/04/2021
v1.1	Updated language on evaluating written prospectus [TDR]	04/26/2021
v1.1	Updated timing requirements for Program of Study [TDR]	12/29/2020
v1.1	Added requirements for new masters degree [TDR]	10/20/2020
v1.1	Added additional discussion to 7th semester talks [TDR]	10/04/2020
v1.1	Updated rules for PhD committee structure [TDR]	10/02/2020
v0.9	Incorporated student feedback [TDR]	08/20/2020
v0.7	First “complete” draft distributed to grad students for comments	07/26/2020
v0.5	Updated version to all faculty [DET]	04/14/2020
v0.2	Comments from LMP, TDR, JPE included	11/20/2019
v0.1	First Google Docs version created by DET	10/17/2019