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INDIANA UNIVERSITY

Graduate Student Handbook

Department of Astronomy

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GUIDE FOR GRADUATE STUDENTS

DEPARTMENT OF ASTRONOMY

This guide is meant as a relatively informal supplement to the Graduate School Bulletin. The document contains general information as well as specific policies and procedures that affect graduate students in the IU Astronomy program. Please read both this document and the Graduate School Bulletin carefully and contact Director of Graduate Studies Enrico Vesperini (evesperi@indiana.edu) or Graduate Secretary Emily Nehus (enehus@indiana.edu) if you have questions.

I. STRUCTURE OF GRADUATE DEGREE PROGRAMS

A. Degrees Offered

The Department of Astronomy offers M.A. and Ph.D. degrees in Astronomy and, jointly with the Department of Physics, a Ph.D. in Astrophysics.

B. Ph.D. in Astronomy

Course Work: Normally, Ph.D. students are required to take the first six of the eight astronomy core courses (see Section II) that are offered. Many students elect to take the other two courses when they are offered as well. The remainder of the required 90 credit hours consists of courses that satisfy the minor requirements, astronomy seminars, and research credits. Completing the six required astronomy core courses can usually be accomplished during the first two years. We encourage all students to enroll for some credit hours of research or independent study as early as possible. The third year is usually divided between research and elective courses and seminars. The fourth and any subsequent years are devoted almost entirely to dissertation work. Degree candidates are encouraged to participate in seminars throughout their residence.

Grades: Graduate students must maintain a grade point average (G.P.A.) of 3.0 or better, as required by the Graduate School. Students who fall below a G.P.A. of 3.0 are put on academic probation for one semester, and they must raise their G.P.A. above 3.0 by the end of that semester or risk being dismissed from the graduate program. In addition, if a student earns a grade below a B (3.0) in a required astronomy course, explicit approval must be granted by the graduate faculty of the department in order for that course to be counted toward the student's degree requirements.

Advising: See Section IV.

Minor: Most astronomy students choose to minor in physics or scientific computing, but students may also choose to minor in other disciplines or even create an individualized minor. The physics minor requires a minimum of 6 credit hours at the 501-level or above, completed with an average GPA of at least 3.0. Students who are completing a physics minor normally meet these requirements with two physics courses taken during their first year. The scientific

computing minor requires students to take four graduate courses from an interdisciplinary selection. Two astronomy courses may count for both the major and minor requirements in this case (current courses that satisfy the scientific computing minor include A570: Galactic Dynamics and A575: Structure and Evolution of Galaxies). Some students choose informatics, mathematics, geology, or chemistry as their minor subjects, in consultation with advisors in these departments.

Qualifying Examination: The qualifying examination for the Ph.D. in astronomy is a 4-hour written examination; calculators and a $8\frac{1}{2} \times 11$ '' sheet of paper with notes are permitted. The exam is offered once a year in mid-May (the second Tuesday after the end of the week of final exams). During the exam, students are required to answer six questions from the eight questions provided.

The exam covers the core course material plus general astronomy at the A450-2 level. It is considered fair to include questions that involve a synthesis of material from different subfields. Six of the eight questions concern material from the core courses while the two additional questions provided may involve recent developments or general astronomical lore. A good preparation would include not only intensive review of core course notes, textbooks, problems, and exams, but also a review of general astronomy at an advanced undergraduate level. Helpful texts for the general review would be an elementary level refresher like Abell, Morrison, and Wolff's *Exploration of the Universe* or Shu's *The Physical Universe* followed by more technically comprehensive texts like Bowers and Deeming's *Astrophysics I and II* or Carroll and Ostlie's *Modern Astrophysics*.

The examination is composed of questions submitted by all of the graduate faculty members in the department. Each question is first graded by two faculty members separately, and then these faculty members meet to decide on a single grade. While students do not pass or fail individual questions, especially poor performances on individual questions are certainly detrimental to the final score. The grades are compiled for all questions into a single total exam grade. The final decision about whether a student passes or fails the exam is made by the graduate faculty of the department. Factors other than performance on the exam (such as academic standing, demonstration of promise as a researcher, and overall motivation) are considered for students whose scores are marginal. In some cases, it may be judged that the exam was passed at a master's level but not a doctoral level. In such cases, the written Ph.D. qualifying exam will be construed as satisfying the general astronomy part of the master's oral exam (see Section I.D). Students are told what their numerical performance was on each problem, and they are free (and often encouraged) to go over problems after the exam with any faculty member or members they wish. Copies of earlier exams are available on the department's web site to aid students who are preparing for the exam. Students should be aware that the format of the exam was modified in 2010 and in 2022.

Ph.D. Candidacy: A student will be admitted to Ph.D. candidacy after they have passed all required qualifying exams and completed all course requirements. The doctoral candidacy dates from the passage of the qualifying exam. The requisite forms should be submitted promptly. Candidacy for the Ph.D. is valid for a seven-year period after the student passes the qualifying

exam. Students who do not complete the Ph.D. within this 7-year period will have their candidacy and enrollment in the degree program terminated.

Research Committee: Students should form and convene a Research Committee within a year of passing the written qualifying examination. The Research Committee must be composed of the student's dissertation advisor (who normally chairs the committee), two or more additional faculty members from the student's major department, and a faculty member who represents the minor. The exact language governing the composition of the research committee, including under what circumstances substitutions of faculty members from other fields or areas may be made, is given in the University Graduate School Bulletin. The Research Committee will conduct the oral dissertation defense and is responsible for final acceptance and approval of the dissertation. Once the Committee is formed, the candidate should convene at least one meeting of the Research Committee in every subsequent academic year until their dissertation is successfully defended.

Candidacy Seminar: The candidacy seminar is an oral presentation to the Research Committee, usually consisting of a dissertation proposal and/or a summary of past research activity. It must be completed within a year of passing the written qualifying examination (typically by the end of the third year of residence). Completion of the candidacy seminar is usually considered by the faculty as sufficient evidence of research proficiency to warrant the granting of an M.A. thesis waiver (see Section I.D). Failure to hold the candidacy seminar within the specified time may result in the student being placed on Academic Probation.

Final Oral Defense of the Dissertation: This consists of a prepared presentation by the candidate interspersed with and followed by questions from the Research Committee members. The formal presentation is usually planned as a 30-50 minute presentation (the actual defense will take much longer than this, of course) and is expected to cover the highlights of the dissertation research. Other members of the graduate faculty may also be present and ask questions. In our department, students often either give a post-defense colloquium or invite all interested faculty, research scientists and graduate students to attend the presentation portion of the defense, in order to share the results of their dissertation research with a wider audience than just the Research Committee.

C. Ph.D. in Astrophysics

General: The Astrophysics Program is administered by a committee of graduate faculty members from the Department of Astronomy and the Department of Physics (typically, at least three faculty members from each department). Students must be admitted to either the astronomy or physics doctoral program before applying for admission to the Astrophysics Program, but students may reside in either department. At any time during their first or second year in the physics or astronomy doctoral program, students may apply for admission to the Astrophysics Program by submitting a written request to the Chair of the Astrophysics Committee. Students in the Astrophysics program usually select their courses with the Astrophysics requirements in mind before they are formally admitted to the program, so as not to delay their progress toward fulfilling the Astrophysics requirements. Doctoral dissertations in astrophysics may be directed by any qualified member of the Department of Astronomy or Physics graduate faculty.

Course Work: Astrophysics students are required to take a selection of four astronomy core courses, four physics courses, and an elective graduate course from physics, astrophysics, or astronomy, for a total of nine courses. The particular courses are described in Section II.D. Astrophysics students are encouraged to take the entire astronomy core sequence, if possible. Astrophysics students often enroll in a somewhat heavier course load than astronomy students, and sometimes rely on transfer graduate credits to meet some of the physics requirements.

Grades: The G.P.A. requirements in astrophysics are the same as in astronomy, except that the Astrophysics Committee, not the astronomy faculty, decides whether and under what conditions grades below a B (3.0) in astronomy and physics courses may be counted toward degree requirements.

Advising: Astrophysics students are subject to the advising procedures of their resident departments prior to forming their research committee. Once the research committee has been formed, the dissertation director and research committee will be responsible for advising the student.

Minor: Students in astrophysics from the Department of Astronomy automatically fulfill the requirements for a minor in physics; and those from the Department of Physics automatically fulfill the requirements for a minor in astronomy.

Qualifying Examinations: There are three ways a student can pass the astrophysics qualifying examination: i) pass the full Physics qualifying exam, ii) pass the full Astronomy qualifying exam, or iii) pass specially designated parts of the qualifying exams of both departments. In the latter case, the designated half of the physics qualifying exam emphasizes classical mechanics, electromagnetism, and statistical physics but may contain one or two questions from other areas of physics at the undergraduate level. The courses P506, P521, and P556 (see Section II.D) should prepare a student for most of this material. In astronomy, the designated portion of the qualifying examination for astrophysics students consists of four out of the eight questions in the exam. Astrophysics students will have 2.5 hours to complete their portion of the examination.

Students are advised to discuss the physics qualifier with the physicists on the Astrophysics Committee. The physics qualifier is offered once a year in the week preceding the Fall semester. Students must sign up beforehand in the Department of Physics office and should identify themselves as astrophysics students.

The examination requirements must be satisfied by the end of the student's sixth semester in residence. The department of residence may also specify its own deadline for passage of the examination it administers. To remain in the astrophysics program, a student must pass the qualifying examination within two attempts.

Research Committee: The same rules described in Section I.B apply to doctoral candidates in the Astrophysics Program.

Candidacy Seminar: The same rules described in Section I.B apply to students in the Astrophysics Program from the Astronomy Department.

Final Oral Defense of the Dissertation: The same guidelines apply here as for the Ph.D. in Astronomy.

D. M.A. in Astronomy

Most students enter our department with the intention of attaining a Ph.D. degree. For the typical successful Ph.D. student, attainment of a Master's degree is an optional step in the process. Students who choose to leave the program after completing the Master's degree have typically done very well in a variety of pursuits, including technical employment, research support, or education.

Course Work: A minimum of 30 credit hours is required for an M.A. Master's students are required to complete any three of the astronomy graduate core courses. The remaining credit hours may consist of A450, A451, A452, or A453, other core courses, physics courses, and thesis research credits.

Examinations: To complete the M.A., students must pass a two-part oral examination demonstrating mastery of both general astronomy and their research project. Specifically, one half of the examination covers general astronomy topics at the 400-level and topics from the three graduate core courses; the other half of the examination is on the M.A. thesis project. Students may satisfy the first half of this examination by demonstrating an equivalent proficiency on designated sections of the Ph.D. written qualifier; currently, M.A. students must complete 1 of the 2 general astronomy questions and 3 of the 8 remaining questions during a 2.5-hour testing period. Students who wish to complete the qualifying exam only at the Master's Level should announce this intention beforehand. For doctoral students who wish to earn an M.A. en route to the Ph.D., the M.A. examination requirements may be met by demonstrating an equivalent mastery of the subject matter on the Ph.D. written qualifier and by demonstrating equivalent research proficiency during the Candidacy Seminar.

Thesis: A thesis is required for a Master's degree unless an explicit waiver is granted by the graduate faculty. Even with a thesis waiver, M.A. students must still demonstrate research proficiency by working on a significant research project; thus, students with a thesis waiver may not submit the Master's degree form until given explicit approval by their research advisor. Students with a thesis waiver typically demonstrate their research proficiency to the graduate faculty by producing an oral or written presentation that describes their work in Astronomy or Astrophysics.

An M.A. thesis waiver is often granted to doctoral students who are making good progress in both coursework and research. After passing the Ph.D. Qualifying Examination, doctoral students should inform their research advisor and Research Committee if they would like to be considered for an M.A. thesis waiver. If requested, a thesis waiver will be considered by the astronomy faculty members of the student's Research Committee following the student's Candidacy Seminar. If the waiver is denied, the faculty may strongly urge that the student complete a formal Master's thesis in order to demonstrate research proficiency; however, Ph.D.

students are not required to complete a Master's degree if they choose not to. If the M.A. thesis waiver is approved, doctoral students should file the appropriate paperwork required for the M.A. in a timely manner.

Students who plan to end their studies with an M.A. may also be granted a thesis waiver in certain circumstances. With a thesis waiver, the format of the final document or presentation can be adapted to a form most appropriate for the project (including, for example, web pages, a project report, or a journal paper). The M.A. thesis waiver must be approved by the astronomy graduate faculty and should be requested by the student after consultation with the research advisor. Since granting an M.A. thesis waiver depends strongly on concordance with the student's research advisor, this possibility should be discussed early in the process of identifying an appropriate M.A. research project. M.A. students with a thesis waiver may not submit the Master's degree form until they are given approval by the research advisor.

II. GRADUATE CURRICULUM

A. Core Course Requirements

The first two years of astronomy graduate instruction are built around the astronomy core courses. These courses are meant to provide a solid foundation in principles and major results of astronomical research, both traditional and contemporary, with an emphasis on fields in which our faculty members specialize. This foundation is intended to be strong and deep enough for the student to begin a productive career as a researcher in astronomy. In addition, all students are expected to gain a basic understanding of space research through independent reading and 100- or 200-level teaching assignments. While space science and solar system studies are deemphasized in our curriculum, developing further expertise in this area may be desirable depending on your research interests and career plans.

The current core astronomy courses are listed in Table 1; the number in parentheses is the number of credit hours for the course. Typically, three core courses are offered each year. Given a total of eight core courses, this means that each course is offered roughly every other year. The courses do not need to be taken in a specific order. Usually only one core course is offered in the Fall because most physics courses taken by astronomy and astrophysics students are also offered in the Fall and this enables students who need physics courses as part of a major or minor to complete their requirements in a timely manner. Astronomy doctoral students are required to take the first six core courses that are offered. Astrophysics and Master's only students may select any four or three core courses, respectively, to meet their minimum degree requirements. All students are encouraged to take all eight core courses as they are offered.

Astronomy Department Core Courses		
A505	(3)	Principles & Techniques of Observational Astronomy
A515	(3)	Exoplanets & Orbital Dynamics

A520	(3)	The Interstellar Medium
A530	(3)	Galactic Astronomy
A540	(3)	Stellar Atmospheres
A550	(3)	Stellar Interiors
A570	(3)	Galactic Dynamics
A575	(3)	Structure and Evolution of Galaxies
A580	(3)	Physical & Observational Cosmology

B. Research and Seminar Courses

Training in research techniques occurs primarily through projects undertaken in collaboration with one or more faculty mentor(s). Students should approach members of the faculty individually to discuss research opportunities. Furthermore, in-depth exposure to current frontier research or techniques is also provided by graduate seminars of usually two credit hours (see table on next page) and by attendance at the departmental colloquium series. Recently, we have also had informal presentations on a variety of topics by students and faculty at Friday lunch seminars, and at weekly ‘Astro Coffee’ meetings. These activities are considered essential to good graduate training; graduate students should expect to participate in them and organize their weekly schedules accordingly.

There are two courses in the department (A890 and A899) that are used to provide credit hours for student research, and there are two sections of each course. A890 must be used by students enrolled in the Ph.D. program who are not yet officially doctoral candidates and by M.A. students. A899 must be used by students who are doctoral candidates whether or not they have yet filed the Doctoral Candidacy forms. As explained in Section III.B, there is a third graduate student research course, G901, available for doctoral students who have earned more than 90 graduate credit hours. To register for a research course, students *must* have the consent of their faculty research advisor. Furthermore, you must consult with your research advisor about which section of the research course you should take: in one section of each course, only an S (satisfactory) or F (fail) is assigned; in the other, letter grades must be assigned by the research advisor. The number of research credit hours that students register for must also be approved by the research advisor. As with all graduate courses, each credit hour of A890 or A899 should correspond to at least 3-4 hours per week of research activity.

Astronomy Department Recent Seminar Topics for A780			
Semester	Year	Topic	Faculty Organizers
Spring	2004	Chemical Enrichment of the Universe from Stars to Galaxies	L. van Zee
Spring	2005	Design and Development of 30m Optical/IR Telescopes	L. van Zee
Spring	2007	Protostars and Protoplanets	R. H. Durisen

Fall	2007	Stellar Populations	K. Rhode
Fall	2008	Active Galactic Nuclei	J. Salzer
Fall	2009	Planning Science Commissioning Observations with ODI	L. van Zee K. Rhode
Fall	2010	The Astronomy and Astrophysics Decadal Survey	S. Salim
Fall	2011	Astronomy with Archival Data Sets	E. Friel
Fall	2012	Astrophysics of Globular Clusters	E. Vesperini
Fall	2013	Professional Development in Astronomy	E. Friel
Fall	2014	Astrophysical Disks	T. Steiman-Cameron
Fall	2015	Astrostatistics and Scientific Computing	E. Vesperini
Fall	2016	Professional Development in Astronomy	E. Friel
Fall	2017	Effective Scientific Writing	E. Friel
Fall	2018	Astrostatistics and Scientific Computing	E. Vesperini
Fall	2019	Professional Development in Astronomy	K. Rhode
Fall	2020	Exoplanets	S. Wang
Fall	2021	Professional Development in Astronomy	K. Rhode
Fall	2022	The Astronomy and Astrophysics Decadal Survey	S. Salim
Fall	2023	Stellar Populations	K. Rhode

C. Electives

Graduate students are encouraged to take elective courses in physics, mathematics, and other relevant areas throughout their career, as long as such courses do not conflict with core courses or other research commitments. Students with special interests occasionally enroll in advanced physics courses. The program of graduate courses in scientific computing is a source of useful elective courses. This program offers an attractive outside minor for students whose astronomical or astrophysical research is computationally intensive.

D. The Astrophysics Program

The Astrophysics Program is intended for students who are interested in, or whose research or future career may demand, a different balance of astronomy and physics coursework that includes a more intensive background in graduate-level physics. Students in the Astrophysics program are required to take at least four of the eight astronomy core courses (A505, A515, A520, A530, A540, A550, A570, A575, and A580); students are encouraged to take most, or all, of these core courses if possible. In addition, students are required to take four courses or their equivalent from the following list of Physics offerings: P506 (Electricity & Magnetism I; 4 credits), P507 (Electricity & Magnetism II; 4 credits), P511 (Quantum Mechanics I; 4 credits), P512 (Quantum Mechanics II; 4 credits), P521 (Classical Mechanics; 3 credits), P556 (Statistical Physics; 3 credits), P560 (Modern Optics; 3 credits), P609 (Computational Physics; 3 credits), P630 (Nuclear Astrophysics; 3 credits) and P637 (Theory of Gravitation; 3 credits). Students must also take at least one additional graduate physics course or astronomy core course. Other physics or astronomy courses not included in the above lists may be approved by the Astrophysics Committee upon petition by the student. As explained in Section I.C., the three courses P506, P521, and P556 provide appropriate preparation for the Astrophysics portion of the physics qualifying exam, which is given each year in August.

III. GRADUATE STUDENT OPPORTUNITIES

A. Financial Support

Student support within the department comes almost entirely in the form of associate instructorships (A.I.'s), graduate fellowships, and research assistantships (R.A.'s). The A.I. positions are funded by the College of Arts and Sciences; R.A.'s are funded by external or internal grants. In recent years, our students have done well in competitions for external fellowships and dissertation-year fellowships awarded by the College of Arts and Sciences. Routinely, all students admitted with financial support receive continuing support as long as they remain in good academic standing. Continuing support is usually offered as an A.I. or R.A. However, students who are not making adequate progress toward their degree (as evidenced by performance in coursework or research) may not be re-appointed in subsequent semesters and priority for support is given to students in years 1-6 of their graduate studies.

Campus policies for student academic appointees are summarized in the Guide for Student Academic Appointees issued each year by the Office of the Vice Provost for Faculty and Academic Affairs. The Guide is available on the VPFAA website (the URL as of August 2020 is <https://vpfaa.indiana.edu/doc/graduate-student-academic-appointees-guide.pdf>). The Guide addresses the duties and responsibilities of student academic appointees as well as other policies such as the terms of appointments, terminations, leaves of absence, and grievance procedures.

Students employed as R.A.'s or A.I.'s in the Astronomy Department are usually entitled to 12 credit hours of fee remission per semester (see Section III.B for more details) and must enroll for at least 6 credit hours per semester. In addition, any student supported as an A.I. during the entire academic year is also entitled to 6 credit hours of fee remission in the summer. Even with fee remission, students should be aware that they are responsible for any unremittable fees and mandatory fees associated with their enrollment at Indiana University. Costs for enrollment beyond the 12 credit hours in any semester and 6 credit hours in the summer will not be covered by fee remission.

Yearly stipends for graduate students in the astronomy department are usually at least \$22K; graduate students employed as R.A.'s and students with external fellowships typically earn more than students supported as A.I.'s. The 10-month academic year stipend for an A.I. position in the astronomy department was \$18,333 in 2017-18. During Summer 2017, graduate students teaching small sections of 100-level astronomy courses earned \$4,033.

The College of Arts and Sciences has lately been providing recruitment bonuses that the Astronomy department can award to students over their first few years. These have recently been used to provide research fellowships in the summer between students' first and second years, enabling them to focus full time on research and make progress in identifying potential dissertation topics early in their graduate careers. Students should be aware that these recruitment bonuses provide competitive stipend levels for the first two or three years of graduate study, but result in total annual stipends that are higher than typical stipend levels for AI appointments without the bonuses. They are commensurate with typical RA appointment stipend levels, which are currently ~ \$26K-\$27K.

Students are encouraged to apply for external funding, such as NSF or NASA graduate fellowships and Indiana Space Grant Consortium graduate fellowships. Astronomy department students have been quite successful in obtaining external funding through these programs. Internal College and University fellowships and grants are also available, such as College Dissertation year fellowships and the McCormick Science Grants; the department regularly nominates students for these awards and several astronomy PhD students have received these awards in recent years.

B. Fee Remissions and Fee Scholarships

Fee waivers of various types form an important component of graduate student support; these waivers can range in value up to many thousands of dollars per year. Indiana University's policies and procedures for allocation of fee waivers are subject to Federal tax laws and can therefore change on fairly short notice. This section attempts to summarize the *current* policy and address only how fee policies are implemented at the departmental level. Questions at this level can be referred to the department's Graduate Secretary, Financial Manager, Chair, or Director of Graduate Studies. Technical questions regarding your tax liabilities should be posed directly to the Graduate School.

Fee Remission: According to current policy, this form of fee waiver exists for A.I.'s and R.A.'s who are greater than 0.375 FTE (full-time equivalent). Most A.I.'s and R.A.'s are considered 0.5 FTE. Faculty members must include such fees in grant proposals that include R.A. support, and the fees are charged to the grant at in-state rates. Fee waivers for external fellowships are not automatic and must be requested on a case-by-case basis. Fee waivers do tend to be part of fellowship packages generated with IU funds. At present, there is no minimum G.P.A. required for a student to be eligible for fee waivers. Our current understanding is that fee remissions are not taxable. Even with a fee remission waiver, however, students are required to pay all the unremittable and mandatory fees associated with their course enrollments.

Credit Hour Entitlements: Being appointed as an A.I. or R.A. for > 0.375 FTE during the academic year entitles a student to 12 credit hours per semester of fee remission and an academic year A.I. appointment carries a 6 credit hour entitlement for summer courses. Students are urged

to utilize all these credit hours in order to reach a total of 90 credit hours as quickly as possible. This will make them much more attractive for R.A. appointments. Specifically, for a student under 90 credit hours to be appointed as an R.A., the research grant must pay the waived fees at in-state rates in addition to the student's stipend; however, if a student is eligible and enrolls in G901 (see below), the grant is not charged these fees. This is a difference of many thousands of dollars in research funds.

Students over 90 Hours: Regardless of their residency or employment status, students who have earned at least 90 credit hours can enroll in the 6 credit hour course G901, Advanced Research, for a flat fee (currently \$150/semester). While this flat fee is charged directly to the student (i.e., it is not covered by an academic appointment as an R.A. or A.I.), it is significantly lower than the unremittable fees associated with enrollment in other courses. However, dissertation students can enroll in G901 for no more than six semesters. After six semesters of G901, a student must enroll in at least 1 credit hour of A899 each semester until completing their degree. Students who exceed the six-semester limit for G901 should also note that they must enroll in at least 6 credit hours per semester to be appointed as an A.I. or R.A., and will be required to pay the associated mandatory and unremittable fees for these credit hours.

C. Student Duties and Responsibilities

It is expected that all students funded through the department, whether by a fellowship, an A.I., or an R.A. will participate in departmental public outreach activities. This is considered a necessary part of graduate training in a field with such great popular appeal, and it is an explicit component of all departmental A.I. contracts. These activities include, among others, conducting Wednesday public nights at Kirkwood Observatory, leading group tours of Kirkwood Observatory, and assisting with Science Olympiad and the annual IU Science Fest (formerly called the Physics & Astronomy Open House). Sign-up lists are posted or e-mailed well in advance. Students who do not volunteer may be assigned to specific jobs without consultation.

During the 10-month academic year, the A.I. functions assigned to astronomy department graduate students usually include a combination of grading, office hours, and observing events (e.g., using the solar telescope, Kirkwood Observatory, or small telescopes on the roof of Swain West). A.I.'s are usually assigned to assist with a single undergraduate class during the semester and are expected to work closely with the instructor. A.I.'s are expected to attend all lectures and be prepared to assist in classroom activities. While most academic year assignments are associated with classes taught by astronomy department faculty, one or two evening sections of introductory courses like A100 or A105 may be taught by a graduate student A.I.

During the summer sessions, graduate students have the opportunity to teach small sections (10 – 50 students) of introductory level astronomy courses (e.g., A100, A105) on their own. Students wishing to teach such classes in the summer must participate in the A.I. training program described in Section VII. Our summer A.I. budget is usually adequate to support all students who wish to teach. There are usually also some grant-supported summer R.A. positions available.

D. Research Opportunities

The graduate faculty in the department work together to ensure that all of our Ph.D. students become directly involved in research by their second semester in the program. Although there is a strong tendency for students to work with faculty members on research related to an external grant, some students are highly self-motivated and decide to pursue their own opportunities. Some grant proposals have had student co-principal investigators, and our students sometimes obtain summer or even full-year research positions at other institutions. Many faculty members have federally-funded grants, so there is good opportunity for students to participate in funded research projects.

The department itself has some funds for direct support of graduate student research for travel to research facilities, especially the WIYN 3.5-m Observatory. Specifically, the department will pay the travel costs for one trip (typically, the student's first visit) to the WIYN 3.5-m for each graduate student who is interested in observing at the telescope. Students should coordinate with their research advisors and the department administrative staff to arrange for the department to cover this cost. Small amounts of money are also available through the Graduate School and the College of Arts and Sciences to subsidize special dissertation-related expenses or travel. The limited Graduate School funds that are available are awarded on a competitive basis and require documentation and letters of faculty support. Otherwise, students must rely on external faculty grants or external fellowship awards for financial support of their own research (such as page charges, equipment, and travel).

The Department will provide some financial support to attend one conference. Students should consult with their research supervisor to identify the conference to attend. Funds for conferences are limited; students should provide an estimate of the expected costs to the Graduate Secretary and wait for the Department's approval before committing to attend a conference with the Department's financial support. Students are also encouraged to apply for the College Travel Awards (deadlines and details concerning applications for this award are provided in an email sent by the Director of Graduate Studies twice a year).

E. Department Awards and Honors

The Astronomy department recognizes exceptional performance by its students during the annual department awards ceremony. Graduate students are considered for departmental awards recognizing outstanding research (Hollis and Grete Johnson Research Prize), teaching (Frank and Margaret Edmondson Prize for Classroom Teaching), and outreach (Goethe Link Prize for Outreach and Public Education in Astronomy), and service (Department of Astronomy Distinguished Service Award). In any given year, one, more than one, or no awards at all may be given in these various categories. In addition, in alternate years, the astronomy department may award the Swain Fellowship for Graduate Students to an outstanding advanced Ph.D. student. As previously mentioned, outstanding graduate students are also nominated by the department for College and University awards, such as the McCormick Science Grant and Dissertation Year Fellowships.

IV. STUDENT ADVISING AND TYPICAL TIMELINES

A. Advising

Students in their first two years of the Ph.D. program are advised by the Graduate Advising Committee, which is comprised of the Director of Graduate Studies and one other astronomy faculty member. The committee routinely meets with the student before the registration deadline each semester, to help the student plan their courses and to check with the student about progress on research, teaching, and other degree requirements. Routine issues that arise over the course of the student's graduate career are handled by the student in consultation with the Graduate Secretary or Director of Graduate Studies. Occasionally the Advising Committee may hold additional meetings with students to address more substantial issues (e.g., difficulties that arise with meeting course requirements or making progress toward degree milestones). Once a student achieves Ph.D. candidacy (defined as completion of all course and Ph.D. qualifying exam requirements) and is working on a dissertation topic with a specific faculty member, that faculty member will usually take over the role of advising the student about professional and research matters, while the Director of Graduate Studies and the Graduate Secretary continue to provide guidance about routine administrative matters. In addition to the dissertation advisor, a doctoral candidate receives guidance from the Research Committee (see Section I.B), which the candidate is required to convene at least once a year throughout the dissertation research.

B. Typical Progress of a Student

This section first outlines the approximate course of a typical student's progress and then notes common variants on the pattern.

Typical Student: First Year—an entering doctoral student usually has the physics and mathematics background of an undergraduate physics major plus some astronomy courses or some demonstrable astronomy background obtained through personal interest and initiative. These students begin our core course sequence and take physics or computational science courses toward a minor or physics courses toward an astrophysics degree. They often also sign up for seminar courses and begin doing some research. Many students meet the requirements of their chosen minor by the end of the first year. During the summer after the first year, students continue to work on their research projects and enroll in research credits. If a student would like to pursue the Astrophysics degree, application to the Astrophysics program will usually be made during the second semester. An Astrophysics student who has taken P506, P521, and P556 during the first year may choose to take the astrophysics part of the physics qualifying exam in August before the second year.

Second Year—Assuming reasonable performance in the first year of courses, a typical student continues the core course sequence in the second year, takes an increasing number of research credits, participates in the graduate seminar, and takes one or two other elective courses. Having completed the core course sequence, the student should be prepared to take the written Ph.D. qualifying exam on core course material and general astronomy in the late spring / early summer after the second year. If the qualifying exam is not passed in the first attempt, a second attempt is permitted in the following year. Astrophysics students choosing to take all or part of the astronomy qualifying exam would normally do so at this time. The second summer is commonly spent on research related to the student's dissertation topic.

Third Year—By now a student is usually spending most of their time on thesis- or dissertation-related research and on participation in seminars and colloquia. Some students continue, however, to take some elective courses or additional core courses that were not offered

during their first two years. The typical student advances to candidacy following the successful completion of the qualifying exam, and within about six months, forms their Research Committee and gives a Candidacy Seminar. After passing the qualifier, a doctoral student may consider requesting an M.A. thesis waiver. A student who has demonstrated solid research ability is usually granted an M.A. thesis waiver upon completion of the Candidacy Seminar.

Fourth and Subsequent Years—The time from here to completion of a Ph.D. degree varies greatly but is typically two to three years, giving a total graduate career of five to six years. During this time, students must meet with their Research Committee annually to discuss their project and overall progress toward completion of their dissertation. Students are also expected to continue to participate in departmental seminars, colloquia, and outreach activities throughout their residency in the department. Students should make themselves aware of graduate school requirements and deadlines regarding the timing and announcement of the dissertation defense and when the degree will be awarded. Information about these deadlines is available from the University Graduate School. The Graduate School also has specific formatting requirements (e.g., regarding fonts, margins, what sections to include, how students should number their pages, etc.) for theses and dissertations. Students should become familiar with these requirements and check them carefully before preparing and submitting the thesis document. The current URLs for the relevant graduate school policies are included in the checklist below; please see that checklist for information about LaTeX templates that are available to help students prepare their dissertation documents in the correct format.

Common Variants: Occasionally, students enter with little or no astronomy background. They may be advised to take 400-level courses and perhaps only one or two core courses in their first year. Our current tendency, when in doubt, is to recommend an aggressive approach to avoid delay. Students entering with Master's degrees in physics and/or astronomy are not exempted from core courses and follow a fairly typical pattern and time scale, except that they may satisfy some physics (or occasionally astronomy) requirements by transferring credit. Foreign students sometimes encounter difficulties due to language problems or deficiencies in their scientific backgrounds. We try to be flexible and allow up to a year for adjustments if necessary. A student who completes an M.A. thesis will usually take longer to finish a Ph.D. than a student with an M.A. thesis waiver, because the M.A. research can take an additional six to eighteen months.

Support: The typical student will begin with an A.I. and/or Fellowship and thereafter be supported both in the summer and the 10-month academic term by an A.I. appointment, with perhaps one to three years or summers of support as an R.A. during their time at IU. These students will have a fee waiver during both semesters each year and for summer sessions. A limited number of dissertation-year fellowships, which typically provide an annual stipend of \$20,000, are available from the College of Arts and Sciences on an extremely competitive basis; despite this intense competition, Astronomy PhD students have been successful at earning College Dissertation Fellowships in recent years. IU Astronomy students have also been quite successful with competitions for external awards, including NSF, NASA GRSP, NASA ESS, and Indiana Space Grant Consortium (INSGC) Graduate Fellowships.

Checklist for Progress toward Astronomy Ph.D. Degree	
	<p>Submit Advisory Committee eDoc to the College and verify all documents are up-to-date (1st semester)</p> <p>Go to https://college.indiana.edu/student-portal/graduate-students/academic-policies-procedures/ and click on "Appointment of Advisory Committee". You will need to know the University e-mail IDs of the Advising Committee Chair (the DGS), the 2nd committee member, and the Minor Representative.</p> <p>Students who have chosen a Scientific Computing minor develop their course of study with two faculty: one from the student's home department and the other from outside the student's home department. One of the two faculty must be a member of the Graduate Committee on Scientific Computing. The proposed course of study will be submitted for approval by the Graduate Committee on Scientific Computing.</p>
	<p>Complete courses for minor and file relevant documents (often by end of 1st year)</p> <p>If you have chosen a Scientific Computing minor, request certification of completion of minor from the director or an appointed representative.</p> <p>IMPORTANT: in order to make this process efficient, please bring a copy of your unofficial transcript to the director or the appointed representative so that they can certify that you have completed the required minor courses.</p>
	Complete all core astronomy courses (typically by end of 2 nd year)
	<p>Pass Ph.D. Qualifying exam and file Nomination to Candidacy eDoc (summer after 2nd year)</p> <p>Submit your Nomination to Candidacy edoc through the IU Graduate School Bloomington One.IU task page.</p>
	Form Ph.D. Research Committee and complete Candidacy Seminar (often by end of 5 th semester)
	<p>Request M.A. Thesis Waiver and file to obtain M.A. degree, if appropriate</p> <p><i>Access the web-based form to file for the M.A. degree from one.iu.edu</i></p>
	<p>Write 1-2 page Prospectus and file Nomination of Research Committee eDoc (typically by end of 4th year) – NOTE that this must be approved by UGS at least 6 months before date of dissertation defense.</p> <p><i>Access the web-based form to file the Nomination of Research Committee from one.iu.edu</i></p>
	Convene meeting with Ph.D. Research Committee at least once a year until dissertation is successfully defended.
	<p>Complete research and write draft of dissertation in consultation with Ph.D. advisor</p> <p><i>The final dissertation must conform to the formatting requirements of the University Graduate School. These change over time. Look for the latest at</i></p>

	<p>the University Graduate School web site: https://graduate.indiana.edu/thesis-dissertation/formatting/index.html</p> <p><i>NOTE that the Director of Graduate Studies has a set of LaTeX template files that have been successfully used to create PhD dissertation documents with the correct, graduate-school-mandated format; please see the DGS for more details and/or to obtain a copy of the template.</i></p>
	<p>Schedule defense date and file paperwork at least 30 days in advance (NOTE that the 30-day requirement is the date when the UGS <i>approves</i> this paperwork, so the actual filing date for the eDoc should be ~35-40 days in advance)</p> <p><i>Submit the announcement of your thesis defense date from either the University Graduate School web site at</i> http://graduate.indiana.edu/forms/index.shtml <i>or from</i> https://graduate.indiana.edu/thesis-dissertation/deadlines.html</p>
	<p>Successfully defend your dissertation, complete the suggested or required revisions, and submit the dissertation to UGS along with associated paperwork.</p> <p><i>See the University Graduate School web site for submission methods:</i> https://graduate.indiana.edu/thesis-dissertation/submission/index.html</p>
	<p>Print and bind one copy of the dissertation for the department (funding is available – please consult the department Chair) and for any committee members who would like a printed copy. If appropriate, notify national facilities that you have completed a dissertation based on data obtained with their telescopes.</p>

V. GRADUATE STUDENT RIGHTS AND RESPONSIBILITIES

The full policy that specifies the rights and responsibilities of Indiana University students and the expectations for student conduct is given in the Indiana University Code of Student Rights, Responsibilities, and Conduct (also referred to simply as “the Code”), which is available online at studentcode.iu.edu. All Astronomy graduate students should be well-versed in the details of these policies, and consider not only how the Code affects them as graduate students, but also how it affects the students with whom they interact in their roles as Associate Instructors. A.I.’s must also be familiar with the policies and responsibilities given in the Guide for Student Academic Appointees (<https://vpfaa.indiana.edu/doc/graduate-student-academic-appointees-guide.pdf>). A.I.’s should particularly attend to the section of the SAA Guide regarding relations with students: “If faculty members (including graduate students with teaching responsibilities) engage in amorous or sexual relations with students for whom they have professional responsibility, even when both have consented to the relationship, it will be viewed as a violation of the ‘Code of Academic Ethics.’” In other words, Associate Instructors may not have a relationship – even if it is consensual – with students enrolled in the classes they assist with or teach. Lastly, graduate students should be prepared for what to do in case an emergency arises during class or somewhere else on the IU campus. Please see <https://protect.iu.edu> for more information.

In addition to the above general IU policies and resources, students should also be aware of some specific information about the rights and responsibilities of the graduate students in our department.

A. General Rights

Astronomy graduate students are provided with a desk and computer in a graduate student office and some bookcase and file drawer space in that office. They receive a graduate student key which opens all graduate student offices, the Teaching Resource Room, the Conference Room, the departmental computer rooms, the Remote Observing Center (ROC), the main department office (where the copier/printer resides), outside doors to the building, the Kirkwood Observatory front door, and the doors to the 12" Refractor and Solar Lab Rooms in Kirkwood Observatory. A \$20.00 refundable deposit is required for the key. Keys must be returned when the student leaves the program/department.

Several rules of thumb are usually helpful when deciding "rights": a) Generally, graduate students are entitled to facility access and support for responsibilities associated with their astronomical research and with any job (A.I., R.A., outreach, etc.) they have in the department. b) Generally, graduate students must supply their own support (books, notebook paper, etc.) for responsibilities associated with their role as a student. c) Although they have the right to access departmental facilities, graduate students must do so in a manner that recognizes the shared nature of the facility. In particular, they should be sure they are trained in the use of any complex facility by a faculty member directly or by a knowledgeable student or staff member acting explicitly on behalf of the responsible faculty member.

B. General Responsibilities

Department facilities must be used in a thoughtful, considerate, and responsible manner. In many respects, for routine needs, the department functions on the margin, with little budgetary leeway for replacement or repair of essential equipment and with limited budget lines for supplies. When using facilities like the Teaching Resource Room, Computer Rooms, main office, Kirkwood Observatory, and small telescopes, users must ensure that equipment is returned to its proper storage area and that these areas are closed and locked after use, especially when no one is around. The Celestron 8" telescopes are for teaching use only and should not leave the department. The computer rooms and Teaching Resource Room should always remain closed and locked. When in doubt, if you find any door unlocked or propped open when no one is around, then close and lock it. Anyone who needs to enter those rooms should have a key. The department has suffered serious equipment thefts, and there have been occasional, though rare, outbreaks of computer thefts, vandalism, and arson on campus. No one from outside the department should use the departmental computing facilities without explicit faculty permission.

C. Office Supplies, Copying, and Mail

Graduate students are entitled to office facilities and supplies in support of their teaching assignments. A graduate student with full responsibility for teaching a course has the same privileges as a faculty member as far as their teaching assignment is concerned. Except for extreme emergencies, large duplication jobs should not be done on the department's copier but instead should be submitted to MAXI, which typically requires at least a one-day lead time (please consult the department administrative staff for details).

Students doing astronomical research, even if it is not directed by a faculty member, may use departmental services and supplies. The only explicit exception to research access rights concerns Master's thesis and Ph.D. dissertation preparation. Technically, the Graduate School requires students to bear stationery and duplication costs for these documents. All research is supported by the department, including preparation of manuscripts for publication, posters for meetings, and correspondence about research. One exception regarding mail is that students should personally bear costs associated with job searches (e.g., resume preparation costs and postage for job applications). Another exception regarding research is that the department has no specially designated funds of its own to support publication charges for journal articles. These charges are typically high (e.g., ~\$100/page in the AAS journals). Both faculty and students must rely on external grants to meet these costs or publish in journals that do not have page charges (e.g., *MNRAS*).

D. Facilities

Students should be trained by the responsible faculty member before using any observatory facilities on their own. However, once this has been accomplished, graduate students are entitled to access these facilities, even for personal projects and certainly for their A.I. jobs. Kirkwood facilities must be reserved ahead of time to avoid conflicts. Departmental Google calendars are used to reserve observatory and other shared facilities, such as the Conference Room and Remote Observing Center (ROC). Nights on the WIYN facilities are allocated through an internal proposal process; proposals are typically due in October for the Spring Semester and in April for the Fall Semester. Students may serve as PIs on projects that make use of either the WIYN 3.5-m or WIYN 0.9-m telescopes.

The departmental computer support person, Mr. Bob Lezotte, is in charge of assigning accounts on the departmental computing system and should be consulted by students wishing to use the system. It is a student's responsibility to stay informed about department computing policies, especially with regard to use of disk storage space and appropriate use of computing resources. Accounts on Indiana University computers are available by request from the University Information Technology Services (UITs). Departmental computing facilities may be used for astronomical research, teaching, and course assignments. In addition, IU maintains a variety of high-performance computing facilities (e.g., the Scholarly Data Archive, the Data Capacitor II, Karst) that are available to IU faculty, staff, and graduate students who need such resources to facilitate their research.

E. Teaching Equipment

Graduate students are entitled to use the departmental media collection for professional purposes (teaching, colloquia, seminars, public talks). DVDs are available in the Teaching Resource Room, along with projectors and a TV monitor. In addition, there are some 3D materials available through the department and the university, and a 3D projector is part of the equipment available in the large auditorium classroom, Swain West 119. A digital projector and laptop computer are kept in the storage area in the main office. All equipment should be returned promptly to its correct location after use. When teaching classes, graduate students may consult with the person (currently Mr. Curtis Bitner) in charge of demonstrations in the Department of Physics. There is an informal agreement between the departments that Mr. Bitner may be asked to assist with demonstrations in astronomy classes.

F. Teaching Materials

There are many resources available for students preparing to teach their own courses. Lecture notes, homework and exam problems, projects, and class activities that are appropriate for 100-level astronomy courses have been developed by many individuals in the department. Many of these resources are available electronically in an area on Canvas maintained by department personnel. Most instructors are willing to share their materials, but it is normal practice and professional courtesy (and perhaps also legally required) to request explicit permission prior to use when adopting teaching materials that have been developed by someone else. This policy applies to faculty as well as students.

G. Open Houses and Outreach

The department hosts members of the public during a variety of open house and outreach activities: 1) the Kirkwood Open House occurs on most Wednesday evenings during regular semesters & summer sessions; 2) daytime public tours of Kirkwood Observatory are scheduled on specific weekdays during the year; 3) the IU Science Fest is held once a year on a Saturday in the Fall; and, 4) Science Olympiad is held during one weekend in the Spring. Involvement in these events is part of your professional training. All students supported through the department, whether on a Fellowship, A.I., or R.A., are required to participate. Students are welcome to take

additional initiatives for public outreach and may sign up to use department facilities for this purpose through the Main Office.

H. Graduate Student Governance

Graduate students participate in a variety of departmental activities, including acting as student representatives on the Information Technology (IT) and the AI assignment committees. Each spring, the current graduate students elect a Graduate Student Liaison (GSL) who serves as the astronomy department representative on the University-wide Graduate and Professional Student Organization (GPSO), attends the open-session portions of departmental faculty meetings, helps arrange visits of prospective graduate students, and organizes the semi-annual department picnics. A detailed description of the Graduate Student Governance is included in Appendix B.

I. Guidelines for Advisor-Graduate Student interactions

The Astronomy Faculty have endorsed the following Guidelines from the College of Arts and Sciences (<https://intranet.college.indiana.edu/graduate/research-mentoring-guidelines.html>)

Guidelines for Advisor-Graduate Student Interactions in the College of Arts and Sciences, Indiana University

The success of every graduate student in the College of Arts and Sciences depends in part upon the role of the student's advisor. Whether they work together in a lab or a research team, meet in a seminar, or consult periodically in office hours or online, the advisor and the student together establish a plan for the graduate student's research, work to identify and remove obstacles to success, and ensure that the student has opportunities to develop professional experience. Most of these interactions take place outside the classroom, often in informal interactions. To ensure that these interactions are as productive as possible, the College offers these guidelines.

These guidelines embody many of the best practices used by other institutions and professional societies.¹ They are intended to provide principles for establishing an effective and productive advisor-student relationship that relies on trust, courtesy, clear communications, and shared expectations. These College guidelines provide a general framework for interactions; departments and programs are expected to establish and document more detailed implementation in departmental handbooks and procedures. These guidelines supplement the [IU Student Code](#), which addresses primarily formal academic matters, by attending to the faculty's role in the student's research process.

Faculty Research Advisors should:

- promote an environment that is intellectually stimulating and free of harassment;
- be supportive, equitable, accessible, encouraging, and respectful;
- recognize and respect the cultural backgrounds of students;

¹ Much of this document is copied or adapted from a website at Penn State: <https://science.psu.edu/future-students/graduate-students/guidelines-and-policies>

- be sensitive to the power imbalance in the student–advisor relationship;
- set clear expectations and goals for students regarding their academic performance, research activities and progress;
- discuss policies and expectations for work, either as teaching assistants or research assistants, including work hours, vacation time, and health contingencies;
- establish mutually agreed upon expectations for frequency and format of communication that will provide students with regular, clear feedback on research activities, performance, and progress;
- promote and manage productive and collaborative relationships for students working in large research groups and collaborations;
- provide students with training and oversight in all relevant aspects of research, including the design of research projects, the development of necessary skills, and the use of rigorous research techniques or procedures;
- provide and discuss clear criteria for authorship at the beginning of all collaborative projects and revisit authorship throughout project development as contributions may change;
- foster a safe work environment by discussing and mitigating potential hazards associated with a student's research activities;
- encourage participation in professional meetings and try to secure funding for such activities;
- ensure students receive training in the skills needed for a successful career in their discipline, including oral and written communication and grant preparation as appropriate;
- recognize that some students will pursue careers outside of academia and/or outside their research discipline and assist them in achieving their chosen career goals;
- be a role model by acting in an ethical, professional, and courteous manner toward other students, staff, and faculty.

Graduate Students should:

- recognize that they bear the primary responsibility for the successful completion of their degree;
- complete all tasks assigned by the department, including teaching, grading, and other assistantship responsibilities;
- know the policies governing graduate studies in the department and the graduate school and take responsibility for meeting departmental and graduate school deadlines;
- be proactive in communicating with the advisor and research committee about progress and challenges associated with research and program trajectory;
- recognize that in addition to their role as a student, they have rights and responsibilities as employees of the university, and expect that these are clearly conveyed to them;
- clearly communicate with their advisor(s) regarding their career preferences and any changes to them during the course of their program;
- be proactive about improving research skills, including written and oral presentation;
- be proactive about teaching professionalization and preparation through exploring workshops and training opportunities;
- seek out appropriate professional service opportunities and take advantage of career planning support in the Walter Center for Career Achievement;
- participate actively in departmental activities such as colloquia, brown-bags, reading groups, etc.;

- seek mentoring and support resources beyond their faculty advisor(s), including other faculty members and peers as well as individuals external to the university;
- inform faculty advisors of potential and/or existing conflicts and work toward their resolution, following departmental guidelines;
- obtain outside help from ombudsmen, graduate chairs, or other faculty if conflicts arise with their advisor;
- be aware that if they feel compelled to change advisors or research direction, they have options and should consult with their advisor, other mentors, or department officers, recognizing that such options may include changing programs;
- always act in an ethical, professional, and courteous manner toward other students, staff, and faculty, respecting the value of their time and responsibilities.

Departments and Programs will:

- provide students with up-to-date information that includes policies, practices, resources, degree requirements, and expectations for progress;
- assist students with selection of their advisors as needed, providing general guidance on expectations for effective mentoring;
- ensure that all students have a faculty member with responsibility for advising them;
- proactively monitor graduate student progress toward their degrees and professional development, including mentoring meetings, committee meetings, exam completions, and other benchmarks toward the degree. Opportunities should be provided to examine the effectiveness of the student-advisor relationship and offer advice on addressing issues that arise.
- provide students and faculty with contacts, resources, and a clear process for potential conflict resolution (e.g., ombudsperson, director of graduate studies, or department head). Interdisciplinary programs are responsible for coordinating among the home departments of faculty and students.
- assist students who wish to change advisors or research groups in identifying new advisors within the department or program who are receptive to accepting the student, and advising the student on options should no placement be found;
- provide appropriate infrastructure to allow students to complete their education and research in a timely and productive manner;
- provide opportunities for professional development that will be relevant to students seeking careers outside academia and/or their research discipline;
- promote an environment that is intellectually stimulating, safe, and free of harassment;
- provide students with contacts for campus resources that promote health and wellness;
- incorporate these guidelines and recommendations into their departmental policies or handbooks and actively promote their observance.

VI. ADMINISTRATIVE RESPONSIBILITIES

Below is a list of duties for the Astronomy Department Administrative Staff. Please feel free to contact these staff members with questions you may have regarding policies and procedures.

- **Paige Koehler Bowles**, Manager of Administrative Services and Programs
 - Budget

- Payroll
 - Travel
 - Academic Appointments
 - IEF's
 - A21's
 - Scheduling Officer Assistant
 - Classroom Scheduling
 - Foundation Accounts
 - Purchasing
 - Book Orders
 - Proposal Awards and C&G Contact
 - Building Rep contact with Physical Plant and Custodian Service
- **Emily Nehus**, Administrative Assistant and Graduate Secretary
 - Web, printing support, restock paper, transparencies etc..
 - Graduate Records and Applications
 - Qualifier
 - Undergraduate Records (Advising)
 - Proposal Submission
 - Point of contact for outreach, Kirkwood Open Houses, etc..
 - Class work, MAXI orders
 - Departmental communication: Newsletter, Flyers, Posters, Colloquium Sign-up Sheets, departmental address list, donor letters, etc.
 - Colloquium Tea
 - Travel
 - Printed Mail

VII. MANDATORY A.I. TRAINING

Indiana University requires that A.I.'s receive some formal training. All new A.I.'s at IU are required to attend a workshop on teaching strategies for working with diverse populations that is offered before the start of the Fall Semester. The department assumes that students who are assisting in courses taught by faculty members will be informed directly about their teaching and grading responsibilities by the specific faculty member they are assisting. There is also a handbook for Associate Instructors at IU that is prepared by the Center for Innovative Teaching and Learning (CITL). All beginning A.I.'s should read and consider it thoughtfully, especially those who did not attend a large state university as undergraduates.

Astronomy department graduate students have the opportunity to teach small classes on their own, including A100, A103, A105, and A107 in summer sessions or an evening sections during the academic year. **To be eligible to teach summer and evening courses, students must participate in the department's formal A.I. training program.** This program has two components:

- 1) attendance at seminars offered by the Astronomy Department or, with the approval of the DGS, lectures sponsored by the CITL, and
- 2) participation in a formal mentoring program with a department faculty member during each independent teaching assignment.

In addition, to be eligible to teach an online course, students must attend at least one seminar related to online teaching.

The Department and the university will offer seminars on teaching at various times during the academic year. To satisfy component #1, new graduate students are expected to attend and participate in at least three such seminars during their first year. (Note that typically, attendance at the teacher training seminars that are required as part of the incoming graduate student orientation activities will satisfy this requirement in most students' first years.) Students continuing as A.I.'s are required to attend at least one teaching seminar per year in subsequent years. Several CITL lectures are offered each semester, and most (but not all) are relevant preparation for teaching small sections of 100-level astronomy courses. With permission of the DGS, students may attend CITL lectures that are relevant to teaching astronomy as an alternative to departmental seminars. The Director of Graduate Studies and the Graduate Secretary will maintain records of student participation to assure that students who teach summer and evening courses are qualified to do so. Students can help facilitate this process by informing the DGS and the Graduate Secretary when they have participated in a teacher training seminar.

Students with summer and evening teaching assignments will be assigned a faculty mentor to provide guidance and feedback. Students are responsible for contacting the mentor prior to the start of the course to discuss teaching approaches and during the course to discuss progress and any issues that arise. For face-to-face classes, faculty mentors are responsible for attending at least one class (and usually two or more) to provide advice and feedback to the student instructor. For online classes, faculty mentors should be added to the Canvas site so that they can experience the online learning environment. Students are encouraged to seek additional teacher training from the CITL or from department faculty, if they feel it would be useful in their development as effective educators.

Students who are teaching courses are required to use the Department's standard course evaluation methods at the end of the terms (course evaluations are currently administered online; instructors may add a limited number of additional questions if they wish). The results of the course evaluations are accessible by the course instructor and are also reviewed by the department Chair (this is true for all courses taught by faculty or graduate students in the department). Graduate students are encouraged to save the information in their course evaluations so that it can be used as part of their teaching portfolios.

VIII. CAMPUS RESOURCES FOR STUDENTS AND INSTRUCTORS

Graduate students, particularly Associate Instructors, should also be aware of campus resources that can help with issues of student life and with concerns that may arise as part of an instructor's teaching duties. Each of these campus offices can be found on the IU "Big List" at <https://www.indiana.edu/about/a-z-list.html/>.

- The **Center for Innovative Teaching and Learning (CITL)** provides assistance in and out of the classroom with the development, implementation, and evaluation of teaching, technology, and course innovation. (<https://citl.indiana.edu/teaching-resources/index.html>)
- **Counseling & Psychological Services (CAPS)** provides counseling for students concerned about relationships, stresses of all kinds, mood problems, anger, cultural adjustments and

substance use that might be interfering with goal attainment – to name a few. Refer troubled students to CAPS.

- The **Student Advocates Office** helps students solve university-related problems – both academic and administrative. The Advocates are administrators and retired faculty who have a wealth of knowledge about the university and serve on the student's behalf. Refer students to the Student Advocate Office if they appear to have administrative or academic problems beyond the scope of your class.
- The **Sexual Assault Crisis Service (SACS)** provides crisis intervention, individual and group counseling and educational programming for victims of sexual assault and their family and friends. SACS also offers after-hours crisis phone consultations at 812-855-8900. The US Department of Justice estimates that one in six women college students is sexually assaulted. Students who have been sexually assaulted often suffer from anxiety and depression, and many drop out of school. If a student reports a sexual assault, direct the student to the support and resources provided by SACS.
- The **Health Center** provides comprehensive health services to meet the medical and psychological needs of students, spouses and dependents (12 years and older). Included are full service appointment or walk-in medical clinic appointments, pharmacy, lab tests, x-rays, physical examinations, eye clinic, gynecological services, allergy shots, physical therapy, and health and wellness education.
- **Disability Services for Students (DSS)** ensures the accessibility of University programs and services to eligible students. Accommodations are individually determined based on disability-specific need and may include modified testing environments, sign language interpreters, and assistance obtaining books in audio format. Students who need accommodations should present you with written documentation from DSS. Students who request accommodations without DSS documentation should be referred to the DSS office.
- The **Assistive Technology and Accessibility Centers (ATAC)** provide access to specialized assistive technologies that help with reading, writing, studying, and information access.
- **Academic Policies** – The academic policies of the College of Arts and Sciences are summarized on the web at <https://college.indiana.edu/student-portal/graduate-students/index.html>. These policies include leaves of absence, academic procedures, misconduct, parental accommodation, and other topics about which you, as both a student and an instructor, should be informed.
- **Academic Misconduct** – If you discover academic misconduct by students in your class, and you apply a sanction for that misconduct, you **MUST** file an official academic misconduct report with the university. The policies concerning Academic Misconduct are explained in the student code, and the report can be filed online through the Office of Student Ethics in the Division of Student Affairs at <https://studentaffairs.indiana.edu/student-conduct/file-a-report.shtml>.

- **Plagiarism** – Plagiarism is defined clearly in the Code of Student Rights, Responsibilities and Conduct; see this page for details: <http://studentcode.iu.edu/responsibilities/academic-misconduct.html>.
- **Call 911** – If you have a dangerous or disruptive situation in the classroom, call 911. If you have a medical emergency in the classroom, call 911.

Appendix A

POLICIES AND PROCEDURES FOR GRADUATE DEGREE PROGRAMS AND FINANCIAL SUPPORT

APPENDIX A:

Policies and Procedures for Graduate Degree Programs and Financial Support

The College of Arts and Sciences requires that we distribute information to graduate students about policies, procedures, and criteria: a) for advancement of students from masters to doctoral degree programs and b) for awards of various types of financial support. The following are departmental policies and procedures for these and related issues.

Transitions between Degree Programs

Masters to Doctoral. The vast majority of graduate applicants to the Department of Astronomy request direct admission to the astronomy doctoral program. If admitted, these applicants usually do enter our doctoral program directly. These admissions decisions are made by the department's Graduate Admissions Committee using standard criteria (academic records, letters of recommendation, personal statements, and standardized tests). Only a small minority of applicants are admitted to the masters program, either because of some special circumstances or because they only requested admission to the masters program. As long as such students remain in good standing in our masters program, these students may, at any time, submit a written request to the Director of Graduate Studies for advancement from the masters to the doctoral program. The request is then considered at a meeting of the department's graduate faculty. Student performance in course work and in research, including research conducted for the student's masters thesis, are the primary evidence considered in granting such a request. The student's qualifications are also judged relative to current doctoral students and to other doctoral program applicants.

Special Student to Degree Program. Procedures similar to those described above are used to decide whether a graduate student admitted originally as a special non-degree student should be admitted to one of our degree programs. Because special non-degree students can only be admitted for one year, such students must submit their written request for admission to a degree program in their second semester. Their request is then reviewed at a meeting of the department's graduate faculty. The criteria are essentially the same as for masters students requesting admission to a doctoral program.

Doctoral Program in Astronomy to Doctoral Program in Astrophysics. Graduate students may only apply for admission to the doctoral program in astrophysics after they have first established residence in the doctoral programs in either physics or astronomy. No students are ever admitted directly to the Astrophysics Program from outside the I.U. Department of Astronomy or Department of Physics. During a student's first or second year in the physics or astronomy doctoral program, the student may submit a written request to the Chairperson of the Astrophysics Committee for admission into the doctoral program in astrophysics. The request will be considered by the members of the Astrophysics Committee. The admission decision is based on the student's performance in physics and astronomy coursework and indications of potential as a researcher.

Financial Awards

Research Assistantship. Graduate Research Assistantships (R.A.'s) are funded by either external or internal grants awarded to support individual research projects. Allocation of such positions is entirely at the discretion of the faculty member(s) in charge of the research project. Students are free to approach faculty members about the possibility of R.A. support, but these opportunities may or may not be generally advertised, at the discretion of the faculty member(s) in charge of the grant. Students are also occasionally supported as Research Assistants for research projects outside the Department of Astronomy.

Associate Instructorship. The allocation of Associate Instructorships (A.I.'s) within the Department of Astronomy, including the specific assignment of jobs, is the responsibility of the department's graduate faculty. This responsibility is delegated to the A.I. Committee. For the regular academic year and/or semester appointments, it is assumed that all graduate students without other means of support (Fellowships, R.A.'s, Resident Assistantships, external awards, employment, etc.) are interested in competing for A.I. positions. The department faculty determine the distribution of A.I. needs (grading positions, lab assistantships, teaching assignments) and review the full list of students requiring support. Assignments are made using a variety of criteria, including schedule constraints (especially for those students who are still taking classes), academic and research performance, rate of progress toward a degree, and demonstrated grading or teaching ability for the level of the assignment. Priority for support is given to students making normal or superior progress toward completion of doctoral degrees during years 1-6. A.I. positions that require students to teach a full course are usually given to students considered to have the best skills as a teacher. Such students must participate or must have participated in our A.I. Training Program. For the academic year and/or semester assignments, positions are not usually advertised, and students do not need to apply explicitly. All students who need support are automatically considered. In the Spring Semester, some of the department's A.I. positions for the next academic year are usually entrusted to the Graduate Admissions Committee to be awarded to degree program applicants. For Summer Session A.I. assignments, a list of A.I. jobs is either posted or distributed in the Spring. Students then request particular Summer A.I. positions. Consideration for these summer positions is not automatic; students must express their interest by the posted or distributed deadline. The criteria for Summer A.I. selection are similar to those used for academic year and semester appointments. An effort is made to award students one of their top job choices. The Summer Session assignments are usually made by the Department Chairperson consulting with the department's graduate faculty or the A.I. Committee as needed. A.I. assignments for the regular semesters are made by the department's A.I. Committee.

Departmental Graduate Fellowships. The Fellowship money provided annually for graduate recruitment is used to attract and support first-year graduate students. After the first year, such students are subject to the same consideration for R.A. and A.I. assignments as other graduate students. Fellowship awards are made by the department's Graduate Admissions Committee, usually after consultation with the department's graduate faculty.

Special Awards. Nominations of students for awards from outside the Department of Astronomy are done as the opportunities come to our attention. Announcements and deadlines for various award programs are usually posted or distributed. If students or faculty members express interest

in nominations that require action by the Chairperson, the Chairperson and student or faculty involved will usually take the necessary action. The departmental graduate faculty are consulted in particular cases as needed.

Miscellaneous. Students are, of course, encouraged to consider the full variety of graduate student support options that are available outside the Department of Astronomy. For most outside programs, efforts are left to the initiative of the students themselves and/or to the faculty advisor. Students wishing to be nominated for a particular opportunity should consult with their faculty advisor, the Director of Graduate Studies, and/or the Department Chair.

Appendix B

ASTRONOMY GRADUATE STUDENT GOVERNANCE

Appendix B:

Astronomy Graduate Student Governance

Last Updated Jun 1, 2023

- a. Astronomy Graduate Student Committee (AGSC)
 - i. The Astronomy Graduate Student Committee shall be composed of the committee members outlined in Section c.
 - ii. All committee members are expected to attend a meeting in the orientation week for the incoming first years so as to get them acquainted with the department leadership.
 - iii. The descriptions and duties herein will be updated every 3 years to ensure this document remains current. Following revisions, the document must be reapproved by majority vote of all Astronomy graduate students.
 - 1. The document may also be updated as deemed appropriate by the relevant committee member in consultation with the department chair.
 - iv. To otherwise amend or adjust this governance document or the structure of the AGSC, a meeting of the leadership must be adjourned. Such a meeting can be called by any of the leadership and must be seconded by a separate member. Whence a meeting is called, it must convene within two weeks. For a change to the governance to be approved, a simple majority of the leadership must vote in favor.
 - v. In order to approve new positions or to terminate currently defined ones, a majority of all Astronomy graduate students must approve.
- b. Elections
 - i. Committee members i-v will be elected by the general Astronomy graduate student body. These committee members will serve yearly terms beginning July 1.
 - ii. In the beginning of June of each year, the Graduate Student Liaison will solicit nominations for the elected committee members i-vi to serve in those roles for the following year. After a week-long nomination process, there will be a week of voting on the positions after which the results will be announced to all of the graduate students.
 - iii. Group meeting coordinators will either be volunteers or be chosen through an election process determined by that committee. This process should occur at the start of the fall semester and ideally their terms last for a year. In the case that a group meeting coordinator is no longer available to carry out their duties in the spring semester, a new coordinator should be chosen.
- c. Committee Member duties
 - i. Graduate Student Liaison
 - 1. Serves as member of the AI assignment committee.

- a. In the event that the GSL holds an AI position, the Graduate AI Assignment member will be assigned to the first graduate committee member on the following list who does not hold an AI position.
 - i. Undergrad Research Coordinator
 - ii. Chair of the Diversity Committee
 - iii. External Representative
 - iv. Lunch Talk Coordinator
2. Communicates with the department chair and Director of Graduate Studies (DGS).
3. Coordinates yearly all-hands meetings with chair+DGS.
4. Coordinates meetings with colloquium speaker
5. Coordinates elections for positions for future years.
6. Coordinates input on new hires.
7. Attends faculty meetings and relays graduate student concerns to faculty. Solicits feedback from graduate students prior to the meeting and provides summaries to all students afterwards in a timely manner (~3 days).
8. Coordinates with the admissions committee to assist with the visits of prospective students.
9. Conveys problems/concerns regarding mental health, sexual harassment, bullying, etc. to the Department Chair at the request of the affected student.
- ii. Chair of Diversity committee
 1. Coordinates the diversity committee meetings.
 2. Coordinates with faculty and students about content in classes (both undergrad and grad, especially seminars that are more flexible)
 3. Help maintain resources list on website
 4. Keep up to date with diversity action on campus in order to bring back meaningful info to the department
 5. Talk with Graduate Student Liaison and faculty Diversity Chair to make sure any relevant issues are being talked about in faculty meetings
 6. Maintain contact with any long term diversity matters (AIP TEAM-UP meetings with physics department, Hudson & Holland Program, Jim Holland Summer Science Programs etc.)
- iii. Lunch talk coordinator
 1. Create and monitor a google form for submitting names, affiliations, and research interests of potential external speakers
 2. Provide snacks/desserts for lunch talks (to be reimbursed by department secretary).

3. Moderate lunch talks and prepare the tea room structurally and technologically to ensure a smooth experience.
 4. Invite external speakers and solicit talks from members of the department.
 5. Circulate weekly email to department faculty, postdocs, graduate students, and undergraduate majors advertising the time, location, and title of the week's talk, as well as the speaker's name and affiliation. Also to be included is the schedule of upcoming talks.
 6. Maintain department lunch talk calendar which is visible from the department official website.
- iv. External representative
1. The external representative will serve as the Graduate and Professional Student Government (GPSG) representative. They will attend the monthly meetings of the GPSG where they will vote on resolutions concerning graduate and professional students.
 2. The external representative will serve as the department representative to the Indiana Graduate Workers Coalition.
 3. The external representative is encouraged to reach out to the analogous governing bodies of other departments (e.g. Physics, Math, EAS) for coordination of social events.
- v. Undergrad research coordinator
1. In coordination with the Director of Undergraduate Studies
 - a. Serves as the central contact for undergrads if they want to get involved in research. Provides recommendations for who they might be able to work with given their interests.
 - b. Organizes events to involve and integrate undergraduates into the department and astronomy research generally (e.g., research showcases).
 - c. Provides graduate students and postdoctoral researchers with a path for mentoring undergraduates in research.
- vi. Internal Events Coordinator
1. Responsible for planning the department picnic at the beginning of each school year.
 2. Plans and hosts social events for the department in order to build department community outside of courses/research work.
 3. Works closely with the Astronomy Club to plan joint events to integrate undergraduates into the department.
- vii. First-Year Peer Mentor
1. Hosting weekly meetings with first-year students to discuss their experience, answer questions as they come up, and generally aid in their transition to graduate school.
 2. Fostering a welcoming and inclusive environment to help first-year students integrate into the department.

3. Providing insight into department history and politics to help students navigate their environment and contextualize their experiences.
 4. Offering support and guidance as first-year students acclimate to their new responsibilities as graduate students.
 5. Position must be held by a graduate student entering their 4th year or higher.
- viii. Outreach coordinator
1. This position requires working with diverse communities, and should work closely with the department chair and the diversity committee.
 2. Decides in conjunction with the department chair how many outreach activities are required per grad student/per year/semester and which events are required for all.
 3. Coordinates outreach activities in the department. These entail requests from external sources (e.g. WonderLab or local schools), Kirkwood open house nights, and Science Fest.
 4. Position is a paid Student Academic Appointee position assigned by the department chair.
- ix. Group coordinators
1. The group coordinators organize the weekly group meetings in the department. These are the Stellar Group, the Computational Group, and the Extragalactic Group.
 2. Ensure everyone potentially interested is included in emails.
 3. Organize the scheduling of weekly/biweekly meetings each semester.
 4. Moderate meetings.
 5. Send out a reminder for each meeting.