



PHYSICS & ASTRONOMY

THE UNIVERSITY OF NEW MEXICO
Graduate Handbook
Fall 2023 edition



DEPARTMENT OF PHYSICS & ASTRONOMY

physics.unm.edu

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view online at physics.unm.edu/pandaweb/graduate/handbk.pdf

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Welcome to Panda

You have now officially joined our Department. We want you to feel comfortable here, and to have a sense of ownership about this space. Knowing the ins and outs of the department will be useful to you, but there is something else that can contribute to comfort and belonging in a university department: getting to know each other on a personal basis. You and your fellow graduate students come from different states or countries; whether you are a domestic student or an international student, there is bound to be a bit of anxiety upon entering a new university program, so please make an effort to get to know one another. Reach out beyond your own usual group and find out what is interesting about people with other backgrounds, interests, and expertise. Don't just make the easy connections - challenge yourself and take some risks. If you arrived earlier in the summer, share what you already know about the campus and this Department with newcomers. We want this to be a community and only you can make that happen.

Department Facilities

a) The Student/Faculty Commons

The front lobby area is a social area for students and staff to mingle, teach, problem solve, and exchange ideas. At times, we hold special events such as ‘potlucks’ (everyone brings an edible specialty) in this area.

b) Department Library

Books must be formally checked out of our library (Room 3409) by the PandA Staff in the front office. Books may be checked out for a maximum of one semester. Some books are kept on reserve (with a restricted loan period) at the request of a faculty member.

c) Photocopy Room

There are two photocopy machines in Room 1217, located just to the right of the front office. The photocopy room is open between 8:00 a.m. and 5:00 p.m. You may do copying for personal use, homework solutions, or class notes, at a charge of \$.05 per copy, payable at the front office. Alternatively, you may obtain a personal account number that can be entered into the copy machine, and for which you will be billed on a quarterly basis. As a TA/GA/RA, you may have copying needs which the Department will cover; see your faculty supervisor for an appropriate account number. If there are problems with any of the copy machines, please see PandA Staff in the front office for assistance. Do not attempt to fix the problem yourself.

d) Machine Shop

The Department’s Machine Shop (Room 1243) does projects for both instruction and research. If you have sufficient background and expertise, it may be possible for you to use the equipment for a research project. You must have approval from your professor for this and limit use between 7:00 AM and 4:00 PM weekdays only. Anthony Gravagne, Machine Shop Supervisor, will schedule training sessions for new students who are interested in using the shop at some point during the semester. One of the shop machinists must be present whenever the shop equipment is in use.

e) Smoking

Smoking is not allowed anywhere inside the Physics & Astronomy building, or inside any building on campus.

Smoking and the use of any tobacco products are prohibited on all University property except in a small number of designated outdoor areas which are clearly marked.

Communication / Main Office Information

a) Email

Email is used to communicate department events, general news, policy issues, and to send personal messages to individual students. Students awarded an assistantship receive an email with guidelines for electronically accepting their TA or RA only through their UNM email account. The Sr. Academic Advisor will communicate with graduate students using only their UNM email account.

b) Mailboxes

Student mailboxes are located in the hallway to the left of the main office entrance. Yours may be grouped with the TA/GA students' mailboxes, or among those of the general student population. Although e-mail is now the primary source of information, all of your personal mail and special announcements will be placed in your mailbox.

c) physics.unm.edu

Our website is a comprehensive source of Department information: daily/weekly events; student, faculty, and staff descriptions; personal home pages; homework assignments; course listings; and important links.

d) Room Scheduling

The department has several classrooms and conference rooms that are available for your use. If you would like to reserve one of these rooms, please go to the PandA website and click on [Room Scheduling link](#) on the left side of the page. Select a room and a time and an email will automatically go to the front office for approval. You will receive an email confirmation when your room has been reserved.

If you need to borrow one of our laser pointers or remotes for the projectors, please come to the front office to sign the checkout form.

e) TA/GA Assignments

The TA/GA assignments are posted on the PandA website on the [Classes => Class Schedules](#) page. These will be updated as changes occur. TAs are assigned and finalized during duty week. Jessica Dowell assigns and oversees lab TAs and Jim Thomas assigns classroom assistance for faculty with whom the TA will work with and report.

f) Office Supplies

From time to time, you may need supplies for a seminar presentation or a special research project that has been assigned to you by a professor. There are certain materials available in the front office. In order to obtain needed materials, please obtain permission from the appropriate faculty member and then contact the staff in the front office.

g) Photocopy Paper

Contact the staff in the front office if the photocopy paper is depleted.

The Department Staff

The staff of the Department of Physics and Astronomy will be happy to assist you:

Stephen Bishop, Contract & Grant Administrator, Room 1219 Stephen works with faculty, grad students, and prospective students, plus various UNM departments to coordinate the PandA academic programs and to help with assistantships, graduate admissions, and graduation.

Anthony Gravagne, Prototype Machinist/Machine Shop Supervisor, Room 1243 Anthony coordinates shop administration, as well as designing and building equipment.

Ciarra Johnson, Accountant II, Room 1180A The Department accountant is responsible for the reconciliation of all accounts, oversees and manages all fiscal activities. She approves the fall and spring TA contracts.

Christopher Moroney, Facility Services Manager, Room 1211 Chris is responsible for building maintenance. He also assigns PAÍS proxy card and Regener key card permissions.

Julie Morrison, Department Administrator, Room 1218 Julie works closely with the Department Chair, overseeing administrative matters.

Joseph Reichert, Machinist, Room 1243 Joe works in the machine shop designing and building equipment.

Yvonne Muñoz, Fiscal and Administrative Tech, Room 1180 Yvonne handles purchase requests, travel requests, reimbursement requests, PAÍS room scheduling, and other front office duties.

Doris Williams, OSE Academic Advisor, Sr., Room 1408 and CHTM Room 141 Doris handles all student matters for the Optical Sciences and Engineering Programs, and advises graduate, undergraduate, and prospective students.

Leanne Yanabu, Web Designer, Remote Leanne updates the PandA website and updates the graduate student pictures on the PandA student directory. Please submit requests through <http://physics.unm.edu/pandaweb/graduate/PhD.php>

Regener Hall Instructional Staff

Jessica Dowell, Lab Director, RH Room 113 Jessica is responsible for development and oversight of the Department's undergraduate laboratory courses.

Undergraduate Workstudy Students There are a number of undergraduate students who serve in valuable positions as research and staff assistants.

Research Centers

There are additional staff persons working for the various research centers housed within our Department. You will get to know these people as you become familiar with the Centers:

- Center for High Technology Materials
- Center for Quantum Information and Control
- Center for Astrophysical Research and Technologies

Maneuvering through the System

a) Important Places on Campus

In time, you'll get to know the entire UNM Campus like the back of your hand. There are a number of buildings that will be important to you in addition to the Physics & Astronomy building and Regener Hall. Check the map for these:

Regener Hall (I-3, #35)

If you're a TA, this will be your home-away-from-home! Undergraduate courses and labs are conducted at Regener Hall.

The Student Services Center (H-6, #85)

Domestic & International Admissions, Registrar, Registration Information, and Financial Aid center. Nearly all of the departments that are essential to the processing of student information are located under one roof.

Graduate Studies – GS (H-4, #81)

The administrative staff of GS handles all business related to graduate students: TA, RA, and GA contracts pass through GS for final approval; candidacy forms and manuscripts must be approved by GS; academic policies are developed by the Senate Graduate Committee in conjunction with the GS administrative staff.

Student Union (H-5, #60)

The Student Union is “food central” - everything from breakfast items to hot dinners. Student government offices, LoboCard photo operations, Nusenda Credit Union, Lobo Lab with Mac and PC workstations/printers/scanners and various meeting rooms are also located in this building.

Student Health Center (H-5, #73)

Located at the south end of the Mesa Vista row, the Health Center is a comprehensive clinic with physicians, nurse practitioners, and an array of services.

Parking Services (M-17, #198)

If you are planning to regularly drive and park a car on campus, you must obtain a parking permit.

Johnson Center Gymnasium (H-6, 59)

Albuquerque Campus Libraries

- Health Sciences Library & Informatics Center
- Law Library
- University Libraries:
 - Centennial Science & Engineering
 - Fine Arts & Design
 - Parish Memorial (Business, Econ.)
 - Zimmerman (Education, Gov. Info., Humanities, Social Sciences)

Albuquerque Campus Specialty Libraries

- Bunting Visual Resources Library
- Bureau of Business & Economic Research
- Center for Development and Disability Information Network Library
- Center for Southwest Research
- Clark Field Archives & Library
- Museum of Southwestern Biology
- Native American Studies Library
- Tireman Library
- UNM Archives
- Women's Resource Center Library

There are also several museums and galleries situated throughout the campus, and don't forget to check out the ***Observatory (D-4, #208)***!

“First Things First” Information

NetID and UNM Email Address

You must create a UNM NetID to use your UNM email account, register for classes, buy a parking permit, check your financial aid, customize your UNM Web Portal, etc. - go to <https://netid.unm.edu/> and follow the directions as prompted. Email is used to communicate Department events, general news, policy issues, and to send personal messages to individual students. **Assistantship contracts are sent only to UNM email accounts.**

Class Registration

You should register for classes as soon as you have had an advising session with your department academic advisor. The schedule of classes, course related forms for adding/dropping/changing hours/etc and online registration services are available at <http://registrar.unm.edu>. **Avoid a late charge by enrolling before the first day of classes.**

LoboCard

UNM uses a photo identification card to access many of the facilities and services, such as Johnson Gym Center, the various libraries, and student discounts on tickets. The LoboCard will act as a proxy card for entrance into PAIS. The LoboCard office is located on the lower level in the north end of the Student Union Building, room 1077. Your photo will be taken and the card issued while you wait. You must bring your UNM Banner student ID #, a government-issued form of photo identification with you, such as your driver's license, passport, or military ID.

Keys

There is a Key Policy which can be found on the Panda webpage under [Resources=>Facility Services=>Building=>Keys&Locks](#). Chris Moroney will assist you in obtaining the various keys you will need for Department facilities.

Parking

To park on campus, you must purchase a parking permit from Parking and Transportation Services located on 2401 Redondo Drive at the southwest corner of Cornell Visitor Parking Structure. They can be reached at 277-1938 or pats.unm.edu

Student Health Insurance

UNM offers a student health plan to Graduate Students holding an assistantship as determined by Graduate Studies; at least .25 FTE for 31 days after start of classes for the entire semester. Students are automatically enrolled in the assistantship health insurance and need take no action unless they want to waive (opt-out) or add optional coverages; changes would have to be done during the open enrollment period. Insurance starts the first day of classes and spring assistantships include coverage for spring semester and all of summer up until the day before the fall classes start.

Students not eligible for the student health plan can receive medical care at Student Health & Counseling (SHAC) for nominal fees. SHAC is available to all currently enrolled UNM students and health insurance is not required. For more information regarding services

available at SHAC and to get help with researching other insurance options, call 505-277-3136 or visit the [SHAC website](#).

UNM Catalog Online

Each student is expected to use the [University Catalog](#) as an academic guide. All of the University policies and procedures are spelled out in the catalog and, as a graduate student in the Department of Physics & Astronomy, you are primarily responsible for the correct and timely completion of your own academic requirements. The Academic Advisor will provide you with updates and the time-lines for submitting necessary forms to Graduate Studies (GS), however, you are responsible for knowing the regulations and monitoring your own progress because each student's program and pace are unique. On the Registrar's site select UNM Catalog – The Graduate Program for university wide policies. Select Colleges – A&S – Panda – select Graduate Program at top left for Panda policies. Panda MS & PhD requirements plus ASTR and QIS concentrations are also available on the Panda website at link: physics.unm.edu/pandaweb/graduate.

Graduate Studies (GS)

GS is the campus department that implements policy for graduate students. You will find that there are helpful people in GS, each with a responsibility to abide by the policies that have been established by the University Faculty Senate. So long as you familiarize yourself with the procedures outlined in the UNM Catalog, as well as the Department policies, and stay in close contact with your faculty advisor and the department academic advisor, your graduate school experience should be smooth sailing.

RA/TA Contracts

GS monitors the RA and TA contracts to ensure that a student is indeed eligible to hold a contract. A student can become ineligible (“on probation”) if his/her grade point average (GPA) falls below 3.0. As you will be notified of this only when the end-of- semester GPA is calculated, your entire academic program can be placed in jeopardy if you rely on financial assistance to support yourself while at UNM. It is important to maintain awareness of your GPA and to keep in close communication with professors if you are at risk academically. There are circumstances that can impact your academic work, but your academic advisor and other faculty members are here to help forestall major problems. Note that the receipt of 2 grades from the set (F, NC, WNC) during your academic career will place you on probation.

There are multiple rules governing RA and TA contracts. Please see the [Assistantship Policies](#) listed on the GS site. Please note that Fall/Spring assistantships policy differs from Summer, mainly with regard to allowable FTE and enrollment. Please see Summer session guidelines.

Your TA support is contingent upon satisfactory performance of TA duties and meeting GS assistantship eligibility requirements. TAs meeting these requirements are guaranteed 4 semesters whenever they take it. Occasionally students can get partial TA support in their third year and beyond, if they are making good progress in meeting their degree requirements based on their faculty or dissertation advisor's recommendation. All

TA support is subject to the availability of TA funds.

Academic Probation

If your cumulative GPA falls below 3.0, you will be placed on Type 1 Academic Probation. If your GPA does not improve to 3.0 or higher after you have completed 12 semester hours in probationary status, you will be disenrolled from graduate status. While in Type 1 status, you will not be eligible for assistantships, nor will you be allowed to take a comprehensive exam. Although you have a right to petition GS to continue your assistantship contract even while on academic probation, our Department Chair will not support such a petition unless there were serious circumstances involving family or personal health that contributed to your academic probation status.

The Graduate Assistant Bill of Rights

The following refers to TAs and RAs:

1. Graduate Assistants are colleagues in teaching.
2. Graduate Assistants' duties and workloads for grading:
 - a. Grading papers is the first work priority
 - b. Writing solutions to homework is the second priority
 - c. Professors should provide GAs with detailed, written solutions, and the weights of test questions
 - d. Professors should grade their own exams in upper level and graduate level courses
 - e. Graduate Assistants should not be asked to grade for more than two different courses
3. The faculty encourages the Graduate Student Association to be involved in the professional activities of Graduate Assistants and to assist with training of new assistants. The William G. Larsen award for Best Teaching Assistant (\$400) is given each year in recognition of a particularly good job. New TAs who teach labs are encouraged to seek advice from experienced TAs and the Regener Hall faculty/staff members.
4. Professors should intercede for students wanting to drop Teaching Assistantships for Research Assistantships. The Graduate Committee should be given as much warning as possible when discussing a potential RA with a student. Prospective RAs are to be fully informed about what will be expected of them (responsibilities and time commitment), level of compensation, tuition remission, and so on.

5. Grievance procedures - It is essential that there be an orderly and timely procedure for resolving grievances that Assistants may have with their assignments. The procedures are as follows:
 - a. The GSA has a committee to hear and attempt to solve grievances.
 - b. A faculty member is assigned as an ombudsman to hear complaints that are not resolved by the GSA committee.
 - c. The problem should be referred to the Department Chair if other avenues of mediation have been unsuccessful.
6. A faculty member's grievance with a Graduate Assistant's performance should follow the same procedures.

Required Seminar for TAs

All graduate students who are teaching undergraduate labs are required to register for a 1-credit-hour seminar (Physics 452) during each of their first two semesters. Call numbers corresponding with the TA Seminar for Jessica Dowell can be obtained on the PandA website class schedule physics.unm.edu/pandaweb/classes/class_schedules.php. TAs need to be in the seminar for their first two semesters of teaching. Very rarely, a TA has been excused from the requirement of registering for the seminar, but not from the responsibility of participating in it.

The seminars will involve meetings during which the TAs discuss relevant physics / astronomy / astrophysics questions concerning upcoming lab sessions, and will also include a thorough prep and rehearsal of individual lab presentations.

The University and the School of Arts & Sciences have established policies regarding student-faculty relationships and sexual harassment. Graduate Teaching and Research Assistants are considered members of the faculty and are expected to conduct themselves accordingly. TAs are expected to abide by FERPA rules regarding student information privacy in the classes they TA.

Responsible Conduct of Research (RCR) Seminar

Undergraduate, graduate student, and postdoctoral researchers are required to receive certification in Responsible Conduct of Research as students and postdocs could be switched to NSF/NIH grants as deemed necessary by the principal investigators at any given time. If a student or post doc does not have the certification, they may not be permitted to work on the grant. Initial certification is for 4-years. After that recertification is required and this can be done attending a workshop and completing an online module.

The Physics department sponsors a Responsible Conduct of Research seminar for the last 4 weeks of each Fall semester in the New Grad Students -Chair's Seminar (PHYS 500.002). The seminars are also available through UNM if the Physics Chair's seminar causes a time conflict with a student / post doc's other responsibilities.

The Grey Area Training

UNM provides MANDATORY sexual misconduct prevention training to all UNM Students. Any graduate student who is enrolled in 6 or more credit hours in a degree-granting program with a regular physics presence on campus is required to take this training. The training module, entitled, "THE GREY AREA," found at link: loborespect.unm.edu/education/mandatory-training/greyarea/grad-students.html is an in-person and interactive training that is approximately 1.5 hrs in length. Students only need to take the **in-person** Grey Area training once during their time at UNM, and take the **online** training each year thereafter. Students must complete the in-person training in order to maintain enrollment eligibility for future semesters.

Academic Requirements

As a graduate student in the Department of Physics & Astronomy, you are primarily responsible for the correct and timely completion of your own academic requirements. The Academic Advisor will provide you with updates and the timelines for submitting necessary forms to Graduate Studies (GS). However, you are responsible for monitoring your own progress because each student's program and pace are unique.

There are essential matters that you must keep in mind. For example, once you are Advanced to Candidacy, you will have five years to complete your manuscript and defend your dissertation. This is a firm University rule, and GS grants exceptions only if a petition regarding the Time to Degree rule is submitted with a statement of departmental support from your research advisor and approved by the Dean of Graduate Studies.

The UNM Student Catalog spells out very clearly all aspects of university policy regarding completion of degrees. Confusing points may arise when there are unusual circumstances surrounding transfer credits or previous degrees. Again, petitions can be submitted to address such issues.

The Department of Physics & Astronomy has developed a set of policies specific to our department. These are outlined on the following pages, so we urge you to keep this handout as a reference and academic guide for the future.

You are bound by the provisions and policies set out both in this handbook as well as the UNM Catalog throughout your degree program. Should changes occur in subsequent editions of either publication, you may or may not be accorded the option to switch to the later academic year requirements based on your faculty advisor's recommendation.

The Physics Program

a) Your Personal Faculty Academic Advisor

When you arrive at UNM, you are assigned a faculty advisor, who is selected from the members of the Graduate Committee. Your faculty advisor will advise you on course

work and the candidacy exam. You are encouraged to seek help from your advisor at any time, and you are required to have at least one meeting per semester with your faculty advisor. Generally, this meeting occurs during a week in November and again in April, at which time you and your advisor assess your current academic status and discuss plans for the following semester. You must adhere to your faculty advisor's recommendations, but if you do need to make any changes due to scheduling or other issues, then you must immediately seek and obtain approval for those changes from your advisor before making them. Naturally you may seek assistance from any faculty member, but you will continue to meet with your faculty advisor until you have acquired an approved Application for Candidacy from GS after passing the Candidacy Exam, at which time the chair of your candidacy exam committee becomes your research advisor and the supervisor of your PhD dissertation.

b) Initial Advisement

Advisement begins during 'Duty Week' (the week before classes start) of your first semester, when you will be scheduled to meet with your faculty advisor. At this initial advisement session, your undergraduate (and graduate, if applicable) background and preparation will be carefully evaluated. This is also an opportunity for you to discuss waivers or courses that you have taken at another institution, as well as any other questions you have about the program. You should leave the initial advisement session with a clear idea of what courses you will need to take in the first two years. You will continue to consult your faculty advisor at least once per semester till you have passed the PhD candidacy exam and submitted the Application for Candidacy to GS.

c) Dealing with Problems

Should a student encounter serious problems that impact his/her academic standing or progress, these should be brought to the attention first of the student's faculty advisor, then of the Chair of the Graduate Committee and the Associate Chair for Graduate Affairs, and ultimately the Department Chair.

d) P&A Policy on Graduate Student Leaves of Absence

Graduate students wishing to take a leave of absence of a duration longer than 1 month during the academic term are required to notify the department's Sr. Academic Advisor in advance to request approval from the Graduate Committee. Failure to obtain advance written approval from the department may result in dismissal from the degree program. Approval of a leave of absence does not necessarily grant a postponement in the mandatory schedule for completion of core courses and the candidacy exam. Students holding assistantships prior to beginning leaves of absence are not guaranteed assistantships upon their return to the academic program without prior approval from the Graduate Committee.

Academic Requirements for Graduate Degrees in Physics (as of Fall 2021)

MS in Physics Requirements

To remain in good academic standing, a graduate student must maintain a cumulative grade-point average of at least 3.0 in all courses taken for graduate credit after admission to a graduate degree program at the University of New Mexico.

1) Thesis and Non-Thesis Options

Plan I - Thesis Option:

- At least 24 semester hours of graduate coursework in physics and mathematics are required, together with at least 6 hours of Master's Thesis (Physics 599).
- Defense of a written thesis serves as a final examination. **Announcement of Exam is due a minimum of 2 weeks prior to exam date.** Please follow the Graduate Studies [Thesis Manuscript Submission Procedures](#). To form a thesis committee per GS, see [Thesis Committee guidelines](#), plus [MOU for LANL and SNL](#) members or [MOU for AFRL, NRAO, SNL](#) members if pertinent. [Thesis Formatting](#) guidelines may be found on the GS site, the tab Formatting Aids has a link to a template for LaTeX.

Plan II – Non-Thesis Option:

- 32 semester hours of graduate coursework in physics and mathematics must be taken.
- At least 4 of the 32 hours must be in graded problems or research courses (Physics 552 or 650), and these will serve as the Master's Project for the Program of Studies. These requirements also apply to those graduate students in the PhD program who are seeking a "MS 'on the way' to PhD".

2) Core Course Requirements

- 466 Methods of Theoretical Physics I
- 505 Statistical Mechanics and Thermodynamics
- 511 Electrodynamics I
- 521 Quantum Mechanics I

A grade of B- or above is required in each core course.

A **Program of Studies** must be submitted to GS by the following deadlines in order to graduation at the end of the subsequent semester:

March 1 for Summer, July 1 for Fall, October 1 for Spring

Master's students must maintain progress through the four core courses (466, 505, 511, and 521) at the following minimal rate:

| | |
|-------------------|------------------------------|
| End of Semester 1 | No requirement |
| End of Semester 2 | No requirement |
| End of Semester 3 | 1 core course completed |
| End of Semester 4 | 2 core courses completed |
| End of Semester 5 | 3 core courses completed |
| End of Semester 6 | all 4 core courses completed |

PhD in Physics Requirements

To remain in good academic standing, a graduate student must maintain a cumulative grade-point average of at least 3.0 in all courses taken for graduate credit after admission to a graduate degree program at the University of New Mexico.

The Course Requirements below show the minimum requirements to remain in good academic standing in the program. If at any time you have not met them, you will be ineligible to hold an Assistantship, except with special exemption from the Graduate Committee. In order to request an exemption, you must work with your academic advisor to submit a petition to the committee.

1) Course Requirements

1a) Core Course Requirements.

- 466 Methods of Theoretical Physics I
- 505 Statistical Mechanics and Thermodynamics
- 511 Electrodynamics I
- 521 Quantum Mechanics I
- 522 Quantum Mechanics II **or** 537 Advanced Astrophysics II

A grade of **B-** or above is required in each core course. **In addition, a PhD student must demonstrate good performance in at least three of the five core courses by obtaining a B grade or above.**

A PhD student must maintain progress through the five mandatory core courses (466, 505, 511, 521, and 522 or 537) at the following minimal rate:

| | |
|-------------------|-------------------------|
| End of Semester 1 | 1 core course completed |
|-------------------|-------------------------|

| | |
|-------------------|--------------------------|
| End of Semester 2 | 2 core courses completed |
| End of Semester 3 | 3 core courses completed |

| | |
|-------------------|--|
| End of Semester 4 | 4 core courses completed / 650 At least 3 courses completed with a B grade or above. |
| End of Semester 5 | no requirement |
| End of Semester 6 | all 5 core courses completed |

1b) Elective Course Requirements.

Four advanced graduate courses. All regular (three-hour) 300 or 400-level courses *that are available for graduate credit** for P&A students and all regular (three-hour) 500-level courses are eligible as electives, except 406, 491/492, and courses taken to satisfy the core-course requirements for the Physics PhD**. Different courses taken as Advanced Topics in Optics (569) or Advanced Topics in Physics and Astronomy (581) count as different electives. The four advanced graduate courses must be listed as a standard grade mode and not on a credit/no credit basis. Additional electives taken to fulfill credit hours and not the four required electives may be on a credit/no credit basis.

** To receive graduate credit for eligible 300 or 400 level courses, the course must have an asterisk (one) beside the course number as depicted in the UNM Catalog at link: catalog.unm.edu/catalogs/2022-2023/colleges/arts-sciences/physics-astronomy*

Double check your transcript after the semester to be sure graduate credit was received, it should be automatically assigned as GR not UG.

*NOTE: a double asterisk is available for graduate credit **except** for graduate majors in the department*

*** Science, Engineering, and Mathematics courses that are available for graduate credit may be taken as electives, with permission of your faculty advisor.*

1c) Seminar Course Requirements.

- Overview of Research in Panda (Adv Sem: New Grad Students PHYS 500.002)
- One semester of Colloquium (under PHYS 500.xxx)
- One other advanced one-hour research seminars (under PHYS 500.xxx)

1d) Research Course Requirements.

- 3 credit hours of PHYC 650 Research (usually started in 3rd or 4th semester but in some cases sooner)
- Give seminar on research by the start of the 5th semester (NOTE: a personal or group informal meeting with a research advisor is not counted):

1. It is a scientific talk, publicly announced with its title and date.
2. It takes at least 30 minutes.
3. A faculty member should attend.

2) *The Candidacy Exam* (listed as the "Comprehensive Exam" in GS rules/terms)

After completing the core courses, electives, and research requirements, a PhD student's next task is to find a potential dissertation supervisor and to begin exploratory research with that faculty member. After about a year of initial exploratory research, the student is generally prepared to advance to doctoral candidacy by taking and passing the Candidacy Exam. The faculty member who has supervised the student's initial research is the Chair of the Candidacy Exam Committee and becomes the student's dissertation supervisor upon successful completion of the exam. Please note that the student's Faculty Advisor continues to advise the student on all academic matters until the student has passed the Candidacy Exam and submitted the Application for Candidacy paperwork for PhD.

After passing the candidacy exam, you may submit the Application for Candidacy (AC) to Graduate Studies for their approval and processing in order to advance to candidacy. The AC must be submitted no later than the semester prior to graduation, but ideally soon after passing the exam. You need 48 hours of coursework (400 & 500 level graduate classes, 500 & 581 seminars, 650 Research, 551-552 Problems) on the AC. If you plan to or already have received a MS Plan II "on way to PhD", you need a total of 50 hours of coursework (including the 32 for MS Plan II). In addition to the required coursework hours, you also need a minimum of 18 hours of 699 Dissertation. If not all required hours have been taken, the AC provides a field for "future courses to be used to fulfill degree" in which any remaining coursework hours and the required dissertation may be entered one semester at a time up until the semester you expect to graduate

Announcement of Exam is due a minimum of 2 weeks prior to exam date.

The Candidacy Exam is an oral examination with a 10 to 15 page written component to ensure a student's readiness to enter into research and to demonstrate his/her proficiency in graduate-level physics in his/her subdiscipline.

Once you prepare the written component in consultation with your research advisor, you may send it directly to your candidacy exam committee (at least two weeks prior to the exam).

Candidacy Exam Committee

- The Candidacy Exam Committee consists of four members:
 - A Chair, who has supervised the student's initial research and who becomes the student's dissertation supervisor upon successful completion of this exam;
 - The Chair must have a UNM appointment or a letter of title, but need not be faculty in the Physics department. Refer to [Candidacy Committee guidelines](#), and [CQuIC MOU for LANL and SNL](#) and [CART MOU for AFRL, SNL, and NRAO](#) if pertinent;
 - Two members chosen in consultation with the Committee Chair, at least 2 members must reside in the department;
 - A fourth "outside" member from PandA appointed by the Chair of the Graduate Committee. The role of the outside member is to ensure a departmentwide standard of PhD qualification. Since this outside member is not meant to be an expert in the candidate's subdiscipline, it is essential that the student demonstrate a clear understanding of how his/her research fits into the broader

context of physics/astronomy;

- The **committee must be selected prior** to scheduling the day/time for the exam.

Candidacy Exam Description

- The candidate submits a 10-15 page written component to the committee 2 weeks prior to the exam. The candidate should consult with their research advisor for guidelines about the style and content of the written component, which may depend on the candidate's research experiences and the standards of their research subfield.
- The candidate gives a presentation of about one hour that consists of:
 - i. A description of the initial research project and
 - ii. A brief description of the research project(s) planned for the PhD dissertationThe presentation is followed by a question-and-answer session wherein the student is expected to demonstrate advanced knowledge in the subdiscipline of the proposed dissertation, at a level determined by the Committee.

Additional Candidacy Exam Rules

- **A student must attempt the Candidacy Exam before the end of his/her seventh semester.** In the case of failure, the student must make a second attempt and pass before the end of the eighth semester.
- A student can petition the Graduate Committee for an extension of the deadlines for the Candidacy Exam on the grounds of special, extenuating circumstances.
- On passing their Candidacy Exam, students have until the end of the following semester to form a dissertation committee and file for doctoral candidacy by submitting an Application for Candidacy to GS (unless waiting on a MS degree to be awarded upon which afterward the AC will be submitted). At this stage the student should be finished or close to finishing the formal course requirements. The Application for Candidacy must list at least 18 credit hours in addition to Master's degree requirements (if MS awarded), exclusive of dissertation, earned in courses (>500) taken at UNM. If no MS was awarded, the PhD requires 48 hours of graduate coursework. After GS approval, the transfer from the Faculty Advisor to a Research Advisor will take place.
- After passing their Candidacy Exam, students will be required to give a 30 minute talk on their research once a year to their dissertation committee (external member not required to attend), starting with the academic year after the Exam, until they graduate.
- A **faculty advisement hold** will be placed if the student has not completed their Candidacy Exam or Annual Research Talk the previous Academic Year. Students must either give the talk or submit the [Annual Research Talk Scheduling Form for Late Talks](#) in order for the advisement hold to be lifted. This form is required for all late annual talks, even if the student intends to defend soon.
 - For dissertation committee members: Please print and fill out the [Annual Research Talk Form](#), then submit to the Sr. Academic Advisor. You can also save this file, open in Adobe Acrobat, and fill it out as a digital form to be sent as a pdf attachment to the Sr. Academic Advisor.

3) *The PhD Dissertation Defense:*

Announcement of Exam is due a minimum of 2 weeks prior to exam date.

The candidate must submit the dissertation to all Committee members at least 2 weeks prior to the defense date for review. Please follow the Graduate Studies [Dissertation Manuscript Submission Procedures](#) and see Sr. Academic Advisor for further details. See [GS](#) for official rules and see [Dissertation Committee guidelines](#), and [CQuIC MOU for LANL and SNL](#) and [CART MOU for AFRL, SNL, and NRAO](#) if pertinent.

4) *Overall Schedule and Deadlines for Physics PhD Students:*

| | Core Courses | Research Elective | Candidacy Exam | Dissertation Defense |
|-----------------------------------|--|--------------------------|--------------------------|--------------------------------|
| End of Semester 1 | 1 core course completed | | | |
| End of Semester 2 | 2 core courses completed | | | |
| End of Semester 3 | 3 cores courses completed | | | |
| End of Semester 4 | 4 courses completed At least 3 core courses with a grade of B or above. | PHYC 650 | | |
| By the Start of Semester 5 | | Give Seminar on Research | | |
| End of Semester 6 | All 5 core courses completed | | | |
| End of Semester 7 | | | Candidacy Exam attempted | |
| End of Semester 8 | | | Candidacy Exam passed | |
| End of Semester 10-12 | | | | Suggested dissertation defense |

| | | | | |
|---------------------|--|--|--|--------------------------------------|
| Candidacy + 5 years | | | | GS deadline for dissertation defense |
|---------------------|--|--|--|--------------------------------------|

MS/PhD in Physics with Astrophysics Concentration

We offer a graduate degree in Physics with a Concentration in Astrophysics. The astrophysics concentration has a different sequence of core courses but otherwise has the same requirements as the Physics MS and PhD.

1. Course requirements for a Master of Science in Physics with a concentration in Astrophysics:

Follows the same requirement for Plan I (non-thesis) and Plan II (thesis) M.S. Physics requirements for the number of credit hours. The hours must include ASTR 536 and the choice of three of PHYS 466, 505, 511, 521 and ASTR 537. Details must be discussed with a graduate advisor each semester.

2. Course requirement for a Ph.D. in Physics with a concentration in Astrophysics:

Similar to the standard physics path, this requires a minimum of 48 semester hours of graduate work exclusive of dissertation, with the following course requirements:

- Core courses: ASTR 536 and 537, and a choice of three from PHYS 466, 505, 511 and 521.
- At least 3 of the 5 core courses must be completed with a B grade or better.
- Four electives of which the following are recommended: ASTR 526, 538, 539 and PHYS 581 when the topic is Cosmology or High Energy Astrophysics. Details must be discussed with a graduate advisor each semester.

3. Classical mechanics and Quantum mechanics requirement:

Students taking the Astrophysics concentration will exit with either a Ph.D. or a M.S. degree in Physics. To ensure that they graduate with a sufficient level of knowledge and exposure to the important physics topics of classical mechanics and quantum mechanics, we will require incoming students to take one semester of undergraduate courses in these subjects (PHYS 491 and/or PHYS 303) unless they have taken equivalent courses previously.

PhD in Physics with Quantum Information Science Concentration

We offer the PhD degree in Physics with a Concentration in Quantum Information Science. To earn the degree a student follows the same sequence of core courses as the standard PhD in Physics, but different elective requirements. It requires a minimum of 48 semester hours of graduate work exclusive of dissertation. These hours must include:

- PHYS 466, 505, 511, 521, 522
- “Introduction to Quantum Information Science” (Special Topics: PHYS 480/581 and ECE 595).
- Two elective courses chosen from: PHYS 566 (Quantum Optics); 571 (Quantum Computation), 572 (Quantum Information Theory), 581 (Special Topics: Quantum Optics II), ECE 595 (Special Topics: Quantum Error Correction), ECE 595 (Special Topics: Quantum Communication), CHE 471/587 (Special Topics: CQ²: Quantum Computing for Quantum Chemistry).
- One additional approved elective from the list approved for the PhD in Physics.

The Optical Sciences and Engineering Program

The Optical Sciences and Engineering PhD program is a joint Physics & Astronomy-Electrical & Computer Engineering program approved by the Board of Regents in 1983. It is part of the Western Regional Graduate Program (WRGP) umbrella of programs that are available to qualified residents of participating western states at the resident tuition rate. The Optical Sciences and Engineering MS program has been approved to be offered since Fall 2002.

Faculty Advisement

OSE students will be advised once each semester by a member of the Optics Graduate Committee. The initial advisement session will be carried out by Wolfgang Rudolph for students enrolled through the Department of Physics & Astronomy, and by Marek Osinski for students who are enrolled through EECE.

OSE Committee on Studies

Optical Science and Engineering students have an additional requirement (also see the OSE section of this handbook). You are required to form a Committee on Studies during your first semester in the Department. This Committee will consist of three faculty members, at least one of whom is from the Optics faculty. Once the Committee is established, you should notify Doris Williams, OSE Sr. Academic Advisor. Plan to consult frequently with the Chairperson of your Committee. You are also required to meet at least once each semester with the full Committee to review your progress. One permanent member of the advising committee and one other optics faculty member will participate in your initial advisement session.

The Qualifying Exam and Candidacy Exam (formerly Dissertation Proposal) After passing the OSE Qualifying Exam, the student is expected to either obtain a dissertation research problem from a faculty member, or to formulate an independent dissertation proposal. The student should present this dissertation proposal to his or her Dissertation Committee as soon as possible, but no later than one year after the date of passing the Qualifying Exam. At least two members of the Dissertation Committee, including the Chair, should be Optics faculty. If the dissertation proposal is deemed adequate as a starting point for a PhD dissertation, then the student can formally advance to candidacy and begin dissertation work. (See optics.unm.edu/current-students/exams.html.)

The Dissertation Defense

A satisfactory dissertation must be submitted to the individual members of the Dissertation Committee after the completion of research. Upon receiving the approval of the Committee, the student must defend his or her dissertation work in a pre-advertised presentation to the members of the Dissertation Committee and other interested members of the University.

Academic Requirements in Optical Sciences and Engineering:

To view the required courses for the OSE MS and PhD Programs please see:

optics.unm.edu/programs/masters.html

optics.unm.edu/programs/phd-after.html