



PHYSICS & ASTRONOMY

THE UNIVERSITY OF NEW MEXICO

Graduate Handbook
Fall 2016 edition



The University of New Mexico

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 188) 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. There is a direct link to the library catalog on the left side of our main page “physics.unm.edu”.

c) Photocopy Room

There are two photocopy machines in Room 2, located just to the right of the front office. (This is also the faculty mail room.) 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 154) 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.

b) Mailboxes

Student mailboxes are located in the hallway to the south of the main office. 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) Kiosk

As you enter the lobby, you will see an electronic podium above the front office door---a continually updated news stand --- so take note as you enter. There will be announcements about seminars, colloquiums, and other notable events.

e) Social Media

Our events such as talks, seminars, colloquia, and dissertation defenses are announced on [Twitter](#) and [Facebook](#). There are links on the front page of our website where you can follow us.

f) Lobby Bulletin Boards

You will find listings of students, faculty, and staff along the east wall of the hallway, to the left of the front entrance. There is a photo display of students, faculty, and staff on the opposite hallway wall, and your photograph will be included.

g) 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.

h) 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, and the enrollments for each class/lab are included in the posting.

i) 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.

j) 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 is a great group of people, each of whom is happy to assist you. You will get to know everyone well as time goes by and, until you do, here is a brief introduction:

Alisa Gibson, Academic Programs Coordinator, Room 105 Alisa works with faculty, graduate, and prospective students, plus various UNM departments to coordinate the PandA academic programs and to assist in navigating the system for assistantships and graduation.

Anthony Gravagne, Prototype Machinist/Machine Shop Supervisor, Room 154 John coordinates shop administration, as well as designing and building equipment.

Gary Harrison, Facility Services Manager, Room 120 Gary is responsible for building maintenance, handles the forms to obtain keys, and assigns offices and desks. He also coordinates the assignment of keys for Regener Hall TAs.

Michael Hasselbeck, Sr. Research Scientist II, Room 157 Michael is responsible for the oversight of the Electronics Shop, technical oversight of the Campus Observatory, and maintenance of the projection and audio-video equipment located in our building.

Tom Hess, Analyst Programmer II, Room 111 Provides computer system administration, user support, and software development and maintenance.

Michael Sammy Martinez, Administrative Assistant II, Room 100 Michael handles all purchases for services and equipment, room scheduling, and travel/reimbursements.

Sandra Ortiz, Administrative Support Supervisor, Room 100 Sandra oversees the daily operations of the main office, supervises the main office staff and student employees.

Julie Morrison, Department Administrator, Room 102A Julie works closely with the Department Chair, overseeing administrative matters.

Doris Williams, OSE Program Advisor, Room 8 and CHTM Room 141 Doris handles all student matters for the Optical Sciences and Engineering Programs, works in an advisory capacity with graduate, undergraduate, and prospective students.

Regener Hall Instructional Staff

John Gallegos, Coordinator, Lecture Demonstrations, RH Room 112 John sets up demonstrations for physics classes and maintains equipment and lab facilities.

Mickey Odom, Lecturer/Lab Director, RH Room 113 Mickey 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 Performance Computing
- Center for High Technology Materials
- Consortium of the Americas for Interdisciplinary Science
- Center for Quantum Information and Control
- UNM-LANL Partnership in Quantum Information Science
- Institute for Astrophysics
- New Mexico Center for Particle Physics
- Optical Science and Engineering

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 become of significant importance to you in addition to the Physics & Astronomy building and Regener Hall. You can 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, with pizza and submarine sandwiches in between. Student government offices, LoboCard photo operations, 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/form_new_netid.php 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. The schedule of classes and online registration services are available at <http://registrar.unm.edu>. If you need a call number that is not listed in the schedule of classes, please email pandainfo@phys.unm.edu.

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 office is located on the lower level in the north end of the Student Union Building, room 1077. You must obtain an ID card in order to begin the registration process. Your photo will be taken and the card issued while you wait. You must bring a government-issued form of photo identification with you, such as your driver's license, passport, or military ID and your BannerID or NetID.

Keys

There is a Key Policy which can be found on the panda webpage under [Resources=>Facility Services=>Building=>Keys&Locks](#). Gary Harrison 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 <http://pats.unm.edu/>

Student Health Insurance

Health Insurance (major medical insurance) is provided for graduate students who are employed as TAs, GAs, and RAs. All other students must access the Health Insurance Exchange or through Centennial / Medicaid.

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. Alisa 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.

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 Student Catalog, as well as the Department policies, and stay in close contact with your faculty advisor, your Graduate School experience will 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 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](#).

Please note that RA students are subject to a FICA tax if they are not enrolled in at least 3 credit hours of coursework during the summer. FICA (social security) is deducted at the rate of 6.2% and FICA Medicare is a 1.45% deduction...a total deduction of 7.65% from your paycheck! So, if your Contract Supervisor is willing to cover the tuition for 3 credit hours, it will be to your academic AND financial benefit to take a class. RA students are also subject to a tax on their tuition remission during each semester and, unfortunately, one cannot take a class to avoid this tax. The IRS considers tuition remission to be part of an RA student's income and, therefore, taxable. This tax (which varies depending upon overall income) will only be deducted once during each semester.

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 RA 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 work loads 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 GAs who teach labs are encouraged to seek advice from experienced GAs 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 RAship 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.
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Required Seminar for TAs (policy adopted by P&A Faculty 2001)

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 Jeff Saul and Mickey Odom can be obtained by emailing pandainfo@phys.unm.edu. Registration in these seminars will be optional for undergraduate TAs and for grad students who have already passed the Departmental Preliminary/Comp Exams.

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.

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 time-lines 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. This is a firm University rule, and GS grants exceptions only if a timely petition that is supported by the Department is made by the student.

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 guidelines.

The Physics Program

A) Your Personal Academic Advisor

When you arrive at UNM, you are assigned an academic advisor, who is selected from the members of the Graduate Committee. Your academic advisor will advise you on course work, the preliminary examinations, 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 academic 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. A brief, informal progress report is placed in your file after each advisement session. Naturally you may seek assistance from any faculty member, but you will continue to meet with your academic 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 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 academic advisor. At this initial advisement session, your undergraduate (and graduate, if applicable) background and preparation will be carefully evaluated, and a tentative course curriculum for the first two years of graduate studies will be established and entered into your file. 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 academic advisor at least once per semester till you have passed the PhD candidacy exam and submitted the Application for Candidacy to GS.

c) Optics Committee on Studies

Optics students have an additional requirement (also see the Optics 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. 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.

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

Recent 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 Academic Programs Coordinator 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 preliminary examinations, candidacy examination, and core courses. 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.

e) 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 academic advisor, then of the Chair of the Graduate Committee and the Associate Chair for Graduate Affairs, and ultimately the Department Chair.

Academic Requirements for Graduate Degrees in Physics (as of Fall 2015)

Preliminary Examination

Students entering the MS or PhD programs in Physics must have an undergraduate degree in Physics or its equivalent. Their undergraduate curriculum must have included courses in the four "core subjects" exemplified by the following UNM upper-division courses in Physics (the authors of some typical textbooks used here at UNM are shown):

- Thermodynamics/Statistical-Mechanics (Physics 301): Stowe; Kittel
- Classical Mechanics (Physics 303-304): Marion/Thornton; Symon
- Electricity and Magnetism (Physics 405-406): Griffiths
- Quantum Mechanics (Physics 491-492): Liboff; Townsend; Goswami

The format of the Preliminary Examination and the requirements for passing are given here. The requirements for passing at the Master's and PhD levels are repeated below as part of the MS and PhD degree requirements.

- Applicants who achieve a score of 800 or higher on the Physics GRE Subject Test are excused from Preliminary Exams. Students already enrolled in the PhD program will not be granted a waiver from one or more sections of the Preliminary Examination based on retaking the GRE subject test and achieving a score above 800.
- The Preliminary Examination consists of **4** sections, each of which is a written exam in one of the four core subjects listed above. The level of the exams is that of the upper-division undergraduate courses and texts given above. The exam will be primarily based on material from the exams in the test bank formed by previous exams, from 2004 to the present. All of the necessary and useful formulas and relations will be provided on the front pages of each exam. No "cheat sheets" are allowed.
- There are two sittings of the Preliminary Examination each year, one in January and one in August, both held the Thursday and Friday during Duty Week (the week immediately preceding the start of classes).
- At each sitting, a student can take any number of exam sections. A sitting at which a student takes a particular section is called a chance on that section.
- A student must complete the Preliminary Examination at the appropriate level, Master's or PhD, by the fourth consecutive sitting after entry into the program (i.e., in the sitting that begins the student's fourth semester). These four sittings include the initial sitting on entry into the program. Within these four sittings, there is no restriction on the number of chances on each section.
- A PhD student must pass one section by the second sitting (i.e., in the sitting that begins the student's second semester), two sections by the third sitting, and must pass all of four sections by the fourth sitting. The PhD level of passing on each section is a grade of $\geq 60\%$.
- A non-thesis Master's student must pass one section by the second sitting (i.e., in the sitting that begins the second semester), two sections by the third sitting, and

must pass three of the four sections by the fourth sitting. The Master's level of passing on each section is a grade of $\geq 50\%$. Thesis-option Master's students are not required to take the Preliminary Examination.

- A PhD student who enters the program with a Master's degree and who has taken a comparable set of exams at another institution can petition the Graduate Committee to waive the entire Preliminary Examination, or sections thereof.
- A student can request re-grading of any section of the Preliminary Examination by submitting the exam and a written appeal to the Graduate Exam Committee within one week of the return of the graded exams.

Appeals policy for the preliminary exam

If a student does not pass the requisite number of Preliminary Examinations according to the schedule of sittings described in Graduate Handbook, and is then terminated from the PhD or MS program, he/she can formally appeal the decision. To do so, he/she must submit an application to the Chair of the Graduate Admissions Committee. The application must include:

- A written statement of purpose, justifying the appeal with an explanation of goals for future success
- At least two letters of recommendation from P&A faculty
- A transcript of grades obtained to date at UNM

If accepted, the Appeals Committee will set the terms for continued progress towards passing the Prelim Exam. A student can only submit an appeal one time.

Timetable for the Preliminary Examination (any number of sections can be taken at each sitting)

	PhD-Physics	Non-Thesis MS-Physics
1st sitting	No requirement	No requirement
2nd sitting (Duty Week, Semester 2)	Pass 1 section at PhD ($\geq 60\%$) level	Pass 1 section at Master's ($\geq 50\%$) level
3rd sitting (Duty Week, Semester 3)	Pass 2 sections at PhD ($\geq 60\%$) level	Pass 2 sections at Master's ($\geq 50\%$) level
4th sitting (Duty Week, Semester 4)	Pass all 4 sections at PhD ($\geq 60\%$) level	Pass 3 sections at Master's ($\geq 50\%$) level

Previous Exams

- [Thermo/Statistical-Mechanics](#)
- [Classical Mechanics](#)
- [Electricity and Magnetism](#)

- [Quantum Mechanics](#)
- [Astrophysics](#)

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:

- The Preliminary Examination is not required for the 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.

Plan II - Non-Thesis Option:

- Applicants who achieve a score of 800 or higher on the Physics GRE Subject Test are excused from Preliminary Exams. Students already enrolled in the PhD program will not be granted a waiver from one or more sections of the Preliminary Examination based on retaking the GRE subject test and achieving a score above 800.
- A non-thesis Master's student must pass 1 section of the Preliminary Examination by the second sitting after entry into the program, must pass 2 sections by the third sitting, and must pass 3 sections by the fourth sitting. The Master's level of passing on each section is a grade of 50%.
- 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). 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** can be submitted to GS after the student has completed a minimum of 12 hours of graduate courses in graduate status. It must, however, be submitted to GS by the following deadlines: March 1 for Summer graduation, July 1 for Fall graduation, October 1 for Spring graduation.

An MS student 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

1) Preliminary Examination

Applicants who achieve a score of 800 or higher on the Physics GRE Subject Test are excused from Preliminary Exams. Students already enrolled in the PhD program will not be granted a waiver from one or more sections of the Preliminary Examination based on retaking the GRE subject test and achieving a score above 800.

After entry into the graduate program a PhD student in Physics must pass 1 section of the Preliminary Examination by the second sitting, 2 sections of the Preliminary Examination by the third sitting, and must pass all 4 sections by the fourth sitting. The PhD level of passing on each section is a grade of 60%.

After passing the Preliminary Exams at the Masters level, students are eligible to receive a MS degree "on the way" to PhD provided they fulfill the course requirements for a Masters.

For more information on the Preliminary Exam, click [here](#).

2) Course 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.

2a) 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. A PhD student must maintain progress through the six 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
End of Semester 5	No requirement

End of Semester 6	all 5 core courses completed
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2b) 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 may be on a credit/no credit basis.

** To receive graduate credit for eligible 300 or 400 level courses, a Level Restriction/Graduate Credit Authorization (found on the Registrar Forms site) must be submitted to the Registrar.*

*** Science, Engineering, and Mathematics courses that are available for graduate credit may be taken as electives, with permission of the Academic Advisor.*

2c) Seminar Course Requirements.

- Overview of Research in PandA (under Physics 500.002)
- One semester of Colloquium (under Physics 500.003)
- One other, different advanced one-hour research seminars (under Physics 500.0xx), in each of which an oral presentation is required

3) The Candidacy Exam (which also serves as the "Comprehensive Exam" in GS rules/terms)

After passing the Preliminary Examination and completing the core and elective course 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 (formerly Dissertation Proposal Defense), which also serves as the Comprehensive Exam in GS rules. 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 Academic Advisor continues to advise the student on all academic matters until the student has passed the Candidacy Exam and submitted the Application for Candidacy.

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

- 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;
 - Two members chosen in consultation with the Committee Chair;
 - A fourth "outside" member appointed by the Chair of the Graduate Committee. The role of the outside member is to ensure a department wide 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 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 dissertation. The 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.
- 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.
- The student is required to have the candidacy forms completed at the time of the candidacy exam and to provide them to the Coordinator for Program Advisement, Alisa Gibson, immediately following the successful completion of the exam.
- 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. 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 post-Master's credit hours, exclusive of dissertation, earned in courses (>500) taken at UNM. After GS approval the transfer from the Academic 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 (the external member is not required to attend), starting with the academic year after the Exam, until they graduate. The purpose of this talk is to ensure that the Committee is updated on progress towards graduation and to give feedback to the PhD candidate. This is not an examination.
 - Please fill out the [Yearly Dissertation Talk Form](#) and return to the [Academic Programs Coordinator](#)

Important reminders regarding UNM (GS) requirements in order to advance to doctoral candidacy: To advance to candidacy, a student must submit an Application for Candidacy to GS. The Application for Candidacy must list at least 18 post-Master's credit hours, exclusive of dissertation, earned in courses (>500) taken at UNM. The

student is required to file the Dissertation Committee form with GS immediately after admission to candidacy by the Department.

4) The PhD Dissertation Defense: See [GS](#) for official rules.

5) Overall Schedule and Deadlines for Physics PhD Students:

	Preliminary Examination	Core Courses	Candidacy Examination	Dissertation Defense
End of Semester 1		1 course completed		
Beginning of Semester 2	1 section passed			
End of Semester 2		2 courses completed		
Beginning of Semester 3	2 sections passed			
End of Semester 3		3 courses completed		
Beginning of Semester 4	4 sections passed			
End of Semester 4		4 courses completed		
End of Semester 6		5 courses completed		
End of Semester 7			Candidacy Exam attempted	
End of Semester 8			Candidacy Exam passed	
End of Semester 10-12				Suggested dissertation defense date
Candidacy + 5 years				GS deadline for dissertation defense

MS/PhD in Physics with Astrophysics Concentration

As of the fall 2015, we offer a graduate degree in physics with a concentration in astrophysics. The requirement for graduating within the astrophysics concentration differs somewhat from the standard physics degree in the required core courses and preliminary exams.

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. Under the Astrophysics concentration, the hours must include ASTR 536 and the choice of three of PHYC 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. These hours must include:

- ASTR 536 and 537
- The choice of three from PHYC 466, 505, 511 and 521
- Four electives of which the following are recommended: ASTR 526, 538, 539 and PHYC 581 when the topic is Cosmology or High Energy Astrophysics. Details must be discussed with a graduate advisor each semester.

3. **Preliminary exams M.S. astrophysics concentration:**

Under plan I the student must present a written thesis. Plan II offers a non-thesis option. Similar to the standard physics path, the Astrophysics Concentration will require the students under a non-thesis option to pass three preliminary exams at a 50% level, one within the subject of astrophysics, and the choice of two out of the four SM, EM, CM and QM preliminary exams.

4. **Preliminary exams Ph.D. astrophysics concentration:**

The Astrophysics Concentration will require the students to pass four preliminary exams, one within the subject of astrophysics, and the choice of three out of the four standard SM, EM, CM and QM preliminary exams.

5. **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 (PHYC 491 and/or PHYC 303) unless they have taken equivalent courses previously.

The Optical Sciences Program

The Optical Sciences 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

Optics 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.

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 [new Qualifying Exam format, schedule, and rules](#), eff. 2006.)

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

To view the required courses for the MS Program please see:

<http://www.optics.unm.edu/msprogram.htm>.

To view the requirements for the Ph.D. degree, please see:

<http://www.optics.unm.edu/phdprogram.htm>.