



# Physics & Astronomy Grad Program Academic Orientation

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R Gilman, GPD

Welcome to Rutgers

Seminar in Physics, September 2021  
<http://www.physics.rutgers.edu/grad/633/>



# People You Will Work With

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- Graduate Program Admin: Shirley Hinds
  - Most of the mechanics of doing things
  - Neil works with Shirley, mainly in admissions
- GPD: Ron Gilman = me
  - signatures & advice
- TA assignments: moved to dept. committee
  - lab assignments: Gabe Alba
- Ph.D. Qualifier Committee Chair: Saurabh Jha
- Your research mentor / adviser



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# Paychecks!

- Rutgers pays us every 2 weeks!
  - Most of you have 10 month appointments.
  - 10 months is nearly 22 weeks, so your every 2 week paycheck will be slightly more than your stipend / 22.
  - Some amounts might be withheld, for taxes\*, social security, etc. The amounts should be indicated in the paycheck. Web searches can help you understand them better.
  - A couple months you will get 3 paychecks instead of 2. These are wonderful months when you will feel relatively rich. I recommend you do not spend it all in one evening.
  - For faculty, the number of work days can differ from one year to the next, so our every 2-week paycheck amount can change on January 1. I do not know this happens to you.
  - If your appointment is not in time for your 1<sup>st</sup> paycheck, that amount will be included in your “2<sup>nd</sup>” paycheck.

\*Rutgers tells me not to give tax advice.

# Where Academic Policies Come From

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- NJ state and general Rutgers, largely School of Graduate Studies, policies
  - <https://grad.rutgers.edu/current-students/policies-procedures-students>
  
- Physics and Astronomy graduate program policies
  - General web pages: <https://physics.rutgers.edu/academics/graduate-program/about-the-graduate-program>
  - The “Redbook”: <https://physics.rutgers.edu/academics/graduate-program/the-redbook>

# Degrees and Degree Requirements

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Physics program mainly admit PhD students intending an academic / research career path.

Each year we are typically joined by 15-20 Ph.D. and 2-3 M.S. students.

We typically award:

- M.S.: a few a year
- M. Phil.:  $\approx 0.1$  / year
- Ph.D.:  $\approx 12$  / year

# Degree Requirements: MS

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- 30 credits + final examination
  - MS with essay: 30 course credits\*
  - MS with thesis: 24 course credits + 6 research credits\*
  - AFAIK, no one cares which you get
  - What is the difference between an essay and a thesis?
  - Final examination determined by program: committee evaluates written paper, talk, understanding in answering questions
    - SGS: minimum 3 member committee. P&A: usually 4
- In P&A, PhD students passing their PhD qualifier and having enough credits are considered to have met the requirements for an MS.

\*no courses specified - no fixed program, but ...

# Degree Requirements: MS

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## Credit details for MS

- Up to 12 credits at advanced undergraduate level may be used towards MS
- No more than 9 credits with grades below B.
- Up to 12 credits may be transferred from previous studies elsewhere
  - once 9 credits have been passed at Rutgers
  - must not have been needed for UG degree
  - cannot have been research course
  - Transfer of credits need to be approved by both GPD and SGS
- These details change from time to time



# Degree Requirements: MPhil

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- ABD PhD student with at least 48 credits
- Why does this degree exist?



# Degree Requirements: PhD

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- NJ + SGS requirement: 72 credits + Advancement to Candidacy + PhD defense
  - Research requirement:  $\geq 24$  research credits (701, 702)
  - PhD defense: committee evaluates thesis + talk + understanding in answering questions
    - Minimum 4 member committee, 3 from program, 1 external. P&A: 5 members, 4 + 1 external.
  
- Program requirements on courses
  - 3 core, 5 astronomy, 2 advanced out of area
  - 6 core, 2 advanced in area, 2 advanced out of area



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# Degree Requirements: PhD

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- Physics course requirements
  - First year core courses: 501, 503, 507 in fall, 502, 504, 611 in spring
  - 2 advanced in-area courses
  - 2 advanced out-of-area courses
- Astronomy course requirements
  - First year core courses: 501, 503, 507 in fall, 514 and 607 Galaxies or 608 Cosmology in spring
  - 3 advanced astronomy (606 Stars, 610 ISM, 607 or 608)
  - 2 advanced out of area
- Core courses must be passed either with a grade of B or better, or by passing the challenge exam - we do not waive core courses based on your having taken them elsewhere.



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# Degree Requirements: PhD

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- Areas (Standard OOA courses)
  - Astronomy (514 Radiative Processes, 607 Galaxies, 608 Cosmology)
  - Biophysics (567 Physics Living Matter)
  - Condensed matter (601 Solid State, 620 Many Body)
  - General Relativity (617 GR)
  - Subatomic (605 Nuclear, 613 Particle)
- Some flexibility for advanced in / out of area courses. We do NOT usually count courses from other departments or “technology” courses (e.g., 509 computers in physics, 568 Large Scale Data Analysis). Sometimes we accept credits transferred towards meeting the advanced course requirement. Talk with GPD if you want to use a nonstandard course.



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# Registration

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- Students must be continuously registered
  - MS and Pre-qualifying students can take a term off by registering for 0-credit “Matriculation Continued”
  - Students who do not register are considered to have left the program. They can apply for readmission. There is a one-credit fee.
- You should usually register in the last 1-2 weeks before the term.
  - Graduate P&A courses do not tend to fill out
  - After you register, a term bill will be generated. If you pay the bill yourself, registering early means paying early
  - TAs / GAs / Fellows have their tuition paid by their appointment. If you register early, the bill is due before the appointment can pay it. The appointment will not pay the late fee.



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# Registration

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- You are limited in how many credits you can take each term (without special permission): 18
  - Normally MS students take 3 courses or fewer - this is already enough work
  - First-year PhD students normally take 10 credits of courses - 3 courses + SIP - and 6 credits of appointment - next slide
  - PhD students: you need to average  $\approx 5$  credits / term after 1<sup>st</sup> year to reach 72 credits at 6 years to graduate
  - There are no awards for taking more than the minimum number of credits needed for your degree - but it does cost more tuition



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# Registration

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## □ Research

- Pre-qual PhD and MS students should sign up for 623 / 624 Advanced Studies for a grade
- Post-qual PhD students sign up for 701 / 702 Research in Physics
- Most courses are generally taken once, but these courses and the Advanced Topics courses (eg, 693 Advanced Topics High Energy) can be taken multiple times



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# Registration

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- TAs must register for 6 credits of TA - 877
  - All TAs are expected to take DELTA-P – <https://www.physics.rutgers.edu/deltap/> – Thursdays, 5 PM
- GAs must register for 6 credits of GA - 866
- Fellows must register for 0 credits of Fellow - 811
- These “credits” are counted towards your full-time status and towards your credit limit each term, but they do not count towards your degree
- There is no tuition charge for these credits



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# Registration

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- Definition of full-time status: 9 credits - 1 if PhD student advanced to candidacy
- Definition of half-time status: 7 credits
- International students should check with Global Services to maintain visa compliance - typically we fill out several “reduced credit” forms each term.
- American students often have undergraduate loans, and should be sure that they meet requirements for loan deferral



# Degree Requirements: PhD

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- Advancement to Candidacy and PhD Qualifier
  - Advancement requires passing the 5-6 1<sup>st</sup> year core courses and passing the PhD qualifier exam.
  - You have 4 chances to pass the core courses (course or challenge exam in 1<sup>st</sup> or 2<sup>nd</sup> year)
  - Qualifier most often taken fall of 2<sup>nd</sup> year in program, you have 2 chances to pass
  - Must be passed by end of 4<sup>th</sup> term... but we do on occasion waive this requirement and allow an additional year



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# Qualifier

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- Find research area of interest / mentor, learn about area
  - Goal of qualifier: demonstrate readiness to do research - original research not required
    - General understanding of field
    - Specific understanding of particular topic
    - Importance of topic and what research investigations are called for
    - Understand the underlying physics (and/or astronomy)
  - The subject may not become your dissertation topic
  - The mentor may not become your dissertation advisor



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# Qualifier Setup

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- May: I ask you to informally tell me who you plan to work with
- September 1: Submit “1 page” to Saurabh Jha with
  - title
  - your name
  - your mentor’s name
  - a short paragraph about your topic
  - This paper is intended to allow an appropriate committee to be appointed for you. There is no award for longest writeup. Don’t worry about it too much.



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# Qualifier Overview

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- Learn
- Paper
- Presentation / exam: usually scheduled for October / November of your second year. You schedule with committee.
- Questions.
- 3-member committee + mentor evaluate paper + talk + understanding in answering questions\* - supposed to test your broader understanding of background to your proposed PhD project

\*standard professional activities



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# Qualifier Paper

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- The qualifier paper should be 10-12 pages in length (11 pt font, 4 lines per inch), e.g., Phys. Rev. style
- The paper should consist of at least three parts
  - Introduction: overview of the topic, general background, its importance, and the current problems
  - A more detailed discussion of a particular subtopic and how it helps the field
  - A final discussion on how to address the subtopic in order to advance the field. This might, but does not have to be, part of your dissertation
- All appropriate references and citations included



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# Qualifier Presentation

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- The presentation should be a professional-style presentation (PowerPoint or similar) lasting no more than 20 minutes
- It should cover the elements of your paper in the same manner as you would present at a conference
- Should not get into low-level details (avoid lots of equations, details of experimental apparatus, etc.)
- Should be clear to a non-specialist



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# Qualifier Oral Exam

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- The oral exam tests your understanding of the topic and the essential physics behind it. You should be prepared to answer questions about anything discussed in your paper. Questions might also include basic physics within your general area.
- Questioning may cover more basic topics and will be guided by the quality of responses to questioning. Poor answers may lead to questions about more basic material.
- For an experimental topic, you may be expected to have an understanding of how the detectors you discuss work. [Example: If you talk about a scanning tunneling microscope, you would be expected to understand quantum mechanical tunneling.]



# Degree Requirements: PhD

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- The qualifier is perhaps the most stressful time in graduate school - try not to stress out too much over it



# Degree Requirements: PhD

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- Advancement to Candidacy and PhD Qualifier
  - After you have advanced to candidacy, you must turn in the candidacy form to SGS
  - Usually I check about once a year, and find students who advanced 2 or 3 (or 4....) years ago who have not turned in their paperwork
  - It needs to be signed by your committee for you to graduate
  - A couple years later, your committee members ...
    - might have forgotten they were on your committee
    - might have left the university and become unreachable
  - It is much more work to do, if you delay a few years



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# Degree Requirements: PhD

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- Transferring credits
- Up to 24 credits may be transferred and used towards PhD
  - once 9 credits have been passed at Rutgers
  - must not have been needed for UG degree
  - cannot have been research course
  - must be relevant to PhD
  - must be taken less than 6 years ago
  - Transfer of credits need to be approved by both GPD and SGS
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# Placement / Challenge Exams

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## □ Placement exams

- Check that you are ready to take graduate courses
- Roughly: advanced undergraduate course final
- Met with those failing placement to decide if they would benefit from an advanced undergraduate course
- Canceled 2020 & 2021 in light of pandemic

## □ Challenge exams

- Check if you have mastered a core graduate course you took elsewhere
- Passing allows you to place out of having to take our graduate course, or to take it again if you failed it once
- Still held during pandemic, remotely
- Typically  $\approx$  50% pass rate



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# Timelines

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- There is no timeline for the MS program
  - Can be done in as little as 1 year, often done at a slower pace over several years.
- There is no timeline for the PhD program, except for Advancement to Candidacy
  - Average time to degree  $\approx$  6 years, range from 3 - 10
  - 10 is a maximum time in program allowed by SGS



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# Research

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- We do not as a program assign faculty to work with you
  - You have to figure out what you are interested in, and approach faculty yourself
- What if your interests change?
  - It happens regularly,  $\approx 20\%$  of students end up in an area we did not expect.
  - Most faculty figure that if you have lost interest, you will not be productive
  - Faculty might also change their minds about working with you.
  - PhD students: working with someone for the qualifier is not a commitment for either of you to have to continue together



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# Getting Paid

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- PhD students admitted with support, guaranteed for 5 years
  - TA: teach for \$ (15 hours/week), covers tuition, fees, SHBP insurance
  - GA: research for \$, covers tuition, fees, SHBP insurance
  - Fellow: \$, but no work commitment, covers limited tuition, student insurance
- MS students admitted without support
  - Department does hire “PTLs / coads” to teach, usually labs
  - Faculty sometimes pay students as hourly workers for research



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# Expectations - General

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- You are now mature responsible adults!
- Learn to learn. Learn to self-direct.
  - But we will do some professional development later in the term.
- Be responsible and professional as a TA.
  - Understand what you are expected to do from the course lecturer or administrator.
  - Attend meetings.
  - Prepare for classes / labs.
  - If you have grading to do, get it back to the students in a reasonable time.
  - Attend DELTA-P and learn more - Thursday @ 5 PM.
  - Main department support resource is TAs. If you cannot be a responsible TA, I might not be able to support you.





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## Some Resources

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- In general the graduate school has some resources to help students conference travel, fellowships for finishing students (Bevier), ...
  - Expect these to be severely limited
  - Gradfund
- The department has the Van Dyck fund, which helps support graduate recruiting and grad student travel to summer schools and perhaps conferences
  - Very limited this year
- National Science Foundation Fellowships, ...



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# Research Options

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- Physics: theory or experiment in
  - condensed matter, including surface science and quantum information
  - high energy
  - nuclear physics
  - biophysics
    - "Joint Ph.D. Program" with quantitative biology boot camp
    - <http://proteomics.rutgers.edu/?q=content/joint-phd-program>
  - mathematical physics
  - physics education research
- Astronomy Option



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Thank you

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