

Course Selections

Matt Dawber, GPD, August 22, 2023

The university classifies graduate students according to their G-status

G1: First year graduate student with less than 24 graduate credit hours, who is enrolled in a Master's degree program.

G2: Advanced graduate student with more than 24 graduate credits, who is enrolled in Master's degree program

G3: First year graduate student with less than 24 graduate credits, who is enrolled in a Ph.D. program.

G4: Advanced graduate student with more than 24 graduate credits, who is enrolled in a Ph.D. degree program

G5: Advanced graduate student in a Ph.D. program who is advanced to candidacy by the first day of classes of a semester

The conversion from G1 to G2 is automatic after completion of more than 24 graduate credits at Stony Brook. Same for the conversion from G3 to G4. Conversion from G4 to G5 is done by the graduate school after recommendation from us.

How many credits do I need?

Status	Credit Earned	Degree Program	Credits required
G1	<24	Master	9-18
G2	≥ 24	Master	9-18
G3	<24	PhD	9-12
G4	≥ 24	PhD	9
G5	Advanced to candidacy	PhD	9

Many courses are offered with variable credits (see graduate bulletin). By adjusting credits, you can get the right total number of credits. Seminar credits are also a fairly easy way to pad out your load without taking too many hard courses.

If a course is offered for 0-3 or 1-3 credits, the workload is independent of the number of credits: Zero credit does not mean zero work. By taking courses with zero credit, the department knows that you have fulfilled the requirement.

When swapping courses, change registration between courses with an equal number of credits.

Notes

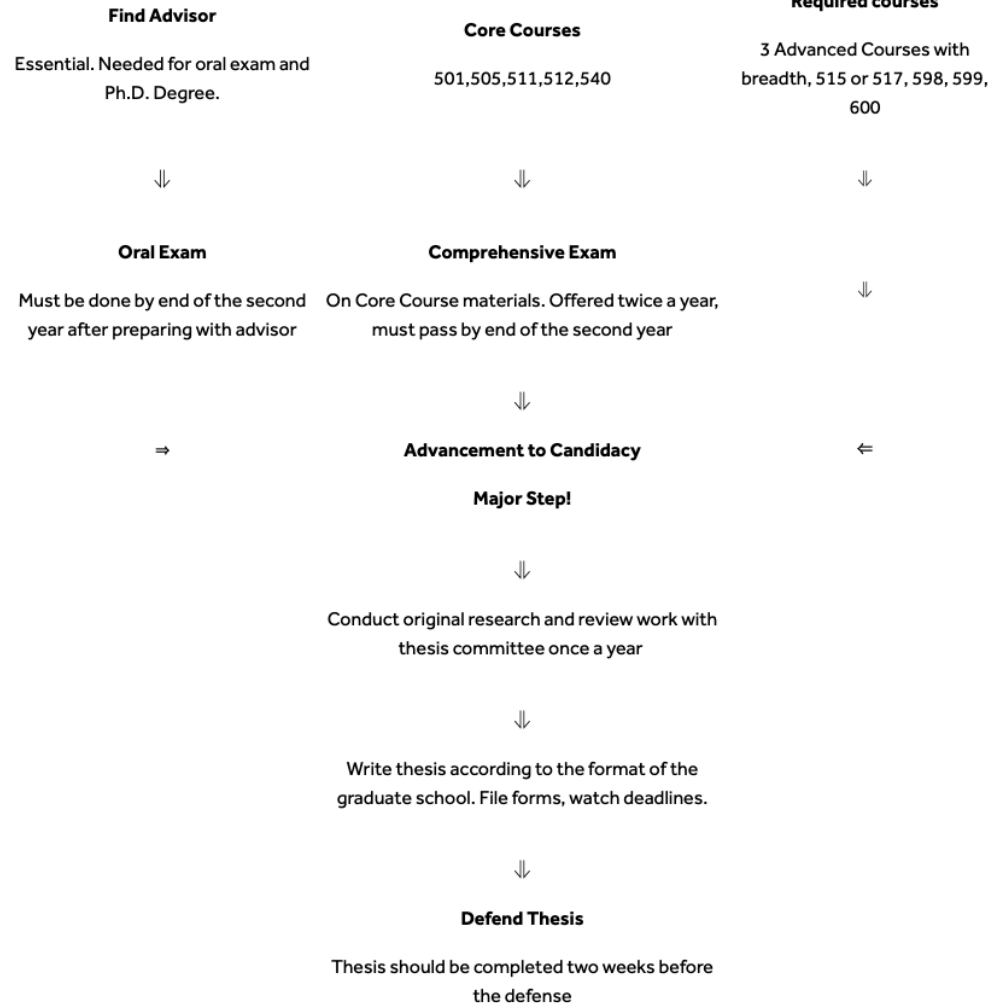
Masters students should be aware that they will pay more if they take more than 9 credits.

PhD students should be aware that they will have to pay tuition for credits above the requirement

If you take courses outside the department, you need permission from the graduate program director

PhD students who have advanced to candidacy you should register for 9 credits in PHY 699 (research). Registering for others courses requires explicit permission by the graduate program director.

PhD Requirements



Typical Course

- Year 1: Take courses and TA.
- First Summer: Work in a Research Lab
- Year 2: Start Research, Take courses in your specialty and TA. If your advisor has funds you can already see if they will hire you as an RA/GA.

At the end of the second year all students should have an advisor who will support them financially for the rest of the program.

- Summer year 2: Working with your advisor prepare and hold your oral exam. As you have passed the comps and completed all required courses, you advance to candidacy in year 3.
- Year 3-5/6: Research! Write papers! Meet with your committee every year. Start writing your thesis well before you plan to graduate! Don't forget to start looking for a job at least 6 months before you want to graduate!

Tracks

In the Department of Physics and Astronomy we have four tracks:

- Physics Track
- Concentration in Astronomy
- Concentration in Physical Biology
- Concentration in Chemical Physics

The Physics Track is the default track. If you complete a Ph.D. in other tracks it will appear on your diploma.

- Students in the Astronomy track have to take three astronomy courses instead of 3 physics breadth courses.
- For Physical Biology the course sequence is quite different whereas for the Chemical Physics track the course requirements are the same as for Physics.

Your research advisor should also have a background appropriate to guide in you research that matches the track you have chosen.

Core Courses

Core Courses, these are required courses unless you have passed the Placement exam in the subject or obtained an exemption based on approved courses taken elsewhere

- PHY 501: Classical Mechanics
- PHY 505: Electricity and Magnetism (with recitation)
- PHY 511/512: Quantum Mechanics
- PHY 540: Statistical Mechanics

How to get an exemption: If a student already successfully passed similar courses elsewhere a student fulfill the course requirements of one or more of these core courses by taking advanced graduate courses (subject to approval by the Graduate Program Director). **Please email me about this ASAP if you have not already done so.**

Otherwise the only way to avoid these courses is by passing the Comprehensive exam at the Placement level.

Most students take these courses.

Other required courses

- Breadth: Three advanced courses in different fields
- PHY 515: Graduate Laboratory – should be taken before the end of the second year, taking it in the third or second semester is recommended. Can be substituted by PHY 517 (Astronomy Lab Course)
- PHY 598-9: Graduate Seminar
- PHY 600: Two semesters of teaching
- PHY 521-4: Students in the Astronomy Track should take three of the four Astronomy Courses

If you fail a required course?

- Fail a Course (less than a B): Repeat the course. Note that you have to submit a retake form which has to be signed by the instructor and the GPD. A course can be retaken only once.
- Fail a Course for a second time: You are no longer in good standing, and unless there are exceptional circumstances, you will have to leave the graduate program. Petition for an oral exam or to do the placement exam. This requires approval of the Graduate Program Director.

Breadth Requirement

Three advanced courses, in three different areas of physics, chosen from a list of courses and areas approved for this purpose. No more than one course from the 680 or 690 series can be used to fulfill this requirement. Courses between brackets may be moved to a different area.

Areas and Courses:

- Astronomy: 521, 522, 523, 524, (683, 688)
- Atomic, Molecular, Optical Physics: 565, 566, (690)
- Accelerator Physics: 554, 543, 564
- Computational Physics: 504, 604
- Solid State Physics: 555, 556, (682)
- Nuclear Physics: 551, 552, (684)
- Particle Physics: 557, 612, 613, (686)
- Physical Biology: 558, 559, (687)
- Quantum Information Science: 568
- Theoretical Physics: 541, 610, 611, 620, 621, (680, 681, 685)

Example Core Course Plans

1st Semester	2nd Semester	3rd Semester	4th Semester
PHY 501 Classical Mechanics PHY 503 Mathematical Methods (Maybe PHY 571 UG E&M)	PHY 505 Electrodynamics (Maybe PHY 578 UG QM) (Maybe PHY 576 UG SM)	PHY 511 Quantum Mechanics I PHY 540 Statistical Mechanics	PHY 512 Quantum Mechanics II
PHY 501 Classical Mechanics PHY 511 Quantum Mechanics I	PHY 512 Quantum Mechanics II	PHY 503 Mathematical Methods PHY 540 Statistical Mechanics	PHY 505 Electrodynamics
PHY 501 Classical Mechanics PHY 503 Mathematical Methods PHY 511 Quantum Mechanics I	PHY 505 Electrodynamics PHY 512 Quantum Mechanics II	PHY 540 Statistical Mechanics	
PHY 540 Statistical Mechanics PHY 503 Mathematical Methods PHY 511 Quantum Mechanics I	PHY 505 Electrodynamics PHY 512 Quantum Mechanics II	PHY 501 Classical Mechanics	
PHY 501 Classical Mechanics PHY 511 Quantum Mechanics I	PHY 505 Electrodynamics PHY 512 Quantum Mechanics II	PHY 540 Statistical Mechanics	
PHY 501 Classical Mechanics PHY 540 Stat Mech PHY 511 Quantum Mechanics I	PHY 505 Electrodynamics PHY 512 Quantum Mechanics II		

Example Astronomy Track

Students whose emphasis will be in astronomy have a modified set of course requirements. During their first two years, they should take three of the four core astronomy courses, PHY 521, 522, 523, 524, which are offered one each semester. Therefore a possible astronomy sequence looks like this:

First Semester	Second Semester	Third Semester	Fourth Semester
PHY 521 - Stars	PHY 524 - Cosmology	PHY 523 - Galaxies	PHY 522 - Interstellar Medium
PHY 501 - Mechanics	PHY 505 - Electrodynamics	PHY 511 - Quantum I	PHY 512 - Quantum II
PHY 540 - Stat Mech	PHY 517 - Astronomical Techniques	PHY 585 - Research	PHY 585 - Research
PHY 598 or 599	PHY 598 or 599		
PHY 600 - Teaching	PHY 600 - Teaching		
PHY 698 - Colloquium	PHY 698 - Colloquium		

The particular order of the astronomy courses is determined by the actual course offering in those semesters. The order PHY540/PHY505 and PHY511/PHY512 can be switched according to the preference of the student. PHY 515 or PHY 517 (discussed above) can be taken in any semester during the first two years.

Physical Biology

Physics Track	Physical Biology
PHY 505 (Electrodynamics)	PHY 505
PHY 511 (Quantum Mechanics)	PHY 511
PHY 540 (Statistical Mechanics)	PHY 540
PHY 600 (Teaching Practicum), two semesters	PHY 600, two semesters
PHY 501 (Classical Mechanics)	PHY 501 or PHY 512
PHY 512 (Quantum Mechanics)	
PHY 515 (Methods of Experimental Physics)	Two semesters of PHY 584 (Lab Rotations)
PHY 598/599 (Graduate Seminar)	PHY 665 (Journal Club), 2 semesters
Two advanced courses	Two life science courses from an approved list
	PHY 558 (Physical Biology)
	PHY 559 (Biological Dynamics and Networks)
	PHY 561 (Biology for Physical Scientists)

Course Plan for the Physical Biology Track

First Semester

PHY 511 - Quantum
Mechanics

PHY 540 - Statistical
Mechanics

PHY 558 - Physical
Biology

PHY 665 - Journal Club

PHY 600 - Teaching

Second Semester

PHY 505 - Electrodynamics

PHY 559 - Biological Dynamics and
Networks

PHY 561 - Biology for Physical
Scientists

PHY 600 - Teaching

Third Semester

PHY 501 - Mechanics

CHE 541 - Biomolecular Structure
and Analysis

PHY 584 - Lab Rotations

PHY 665 - Journal Club

Fourth Semester

PHY 512 Quantum Mechanics II

MCB 515 - Structural Biology and
Spectroscopy

PHY 584 - Lab Rotations

Course Registration

Most PhD students entering from UG will register for the following courses:

- PHY 501, Classical Mechanics (3 credits)
- PHY 511, Quantum Mechanics (3 credits)
- PHY 503, Math Methods **or** Breadth Course (3 credits)
- PHY 598/599, Graduate Seminar (1 credit)
- PHY 600, Teaching Practicum (0-1 credit) (this is your TA assignment and is not a real class)
- PHY 698, Colloquium (1 credit) (you are strongly urged to attend the colloquium each week).
- Seminar courses in your area of interest (0-1 credit)

Exceptions:

- Astronomers: take PHY 521 (Stars)
- Biophysicists: take PHY 558 (Physical Biology)
- Those who passed the placement exam or got waivers from the are not required to take the core courses

MA Program

Requirements

No Thesis Option

- Approved program of study (there is a lot of flexibility)
- Passing 30 credits of graduate courses (2 credits of PHY598/599 are required)
- Passing the Comprehensive Exam at the Master level

Thesis Option

- Approved program of study (there is a lot of flexibility)
- A Master Thesis (with 10-25 research credits (PHY580))
- Total credits should be at least 30 (2 credits of PHY598/599 are required)

Typical Course

Typical Program

- Year 1: Take courses and do some Master thesis research
- Year 2: Work on Master thesis and do additional courses.

Accelerated Program

Only possible if you are very well prepared

- Year 1: Take limited courses and do significant Master thesis research
- First Summer: Do research and write and defend the Master thesis

It is also possible to graduate from the Master program in three semesters or to extend beyond 2 years (though we try to avoid the latter).

If you are preparing for a PhD Program

To be admitted to a PhD program you need strong recommendation letters. Letters written by a course instructor are not the best, because usually they do not know you well enough. Since the letter is already needed in December, it is hard to get a good letter that makes a difference if you are applying to a PhD program after your first semester. To get a good letter you have to work closely with a faculty member starting from the beginning of the semester. Do not neglect that work because that will be the basis of the recommendation letter.

To have a good chance to be admitted to a PhD program you need to have mostly if not all A grades (A or A-) in the courses. **Do not overload yourself.**

Applications after 3 semesters in our program are typically more successful than those after just one semester.

Doing well on the Comprehensive Exam is not required but helpful.

Sample Schedule I

PROGRAM WITH MASTER THESIS RESEARCH -- SCHEDULE I

Undertaking Master thesis research is one of the best ways to prepare an application for a PhD program. It gives you skills that will make you a desirable recruit and provides your advisor with the insight they will need to be able to write you a strong letter of recommendation during semester 3 of the program. It is advisable to take one core course (but only one) in each of the first two semesters.

Semester 1:

PHY501 Classical Mechanics/ PHY 511 Quantum Mechanics I/PHY540 Statistical Mechanics (3 credits)

PHY 503 Methods of Mathematical Physics (3 credits)

PHY xxx Elective in your area of interest (3 credits)

PHY 599 or PHY 598 Graduate Seminar (1 credit)

Semester 2:

PHY 505 Electrodynamics (3 credits) /PHY 512 Quantum Mechanics I (3 credits)

PHY 504 Computational Methods in Physics and Astrophysics I or PHY xxx Elective in your area of interest (3 credits)

PHY 580 Special Research Project (3 credits)

Summer 1:

While it is not required to be at Stony Brook during the summer it can be an excellent opportunity to make significant progress on your research project. Enroll for PHY800 Summer research for 0 credits.

Semester 3:

PHY 595 Master Thesis Research (9 credits)

Semester 4:

PHY 595 Master Thesis Research (1 credit) (International students require permission from VIS to underload, it is typically granted)

Sample Schedule II

SCHEDULE II - COURSEWORK FOCUSED PROGRAM FOR PREPARATION FOR ADMISSIONS TO A PHD PROGRAM WITH A FOCUS ON THEORETICAL PHYSICS

This schedule does not include a Masters thesis as the student will be very busy with courses. It does require passing the comprehensive exam at the Master level. Students following this track should be confident that they can obtain good grades in demanding courses and pass the comprehensive exam by the start of Semester 4 at the latest.

Semester 1:

PHY 501 Classical Mechanics (3 credits)
PHY 511 Quantum Mechanics I (3 credits)
PHY 599 or PHY 598 Graduate Seminar (1 credit)
PHY xxx Electives (3-6 credits)

Semester 2:

PHY 505 Electrodynamics (3 credits)
PHY 512 Quantum Mechanics II (3 credits)
PHY 610 Quantum Field Theory I (3 credits)
PHY xxx Elective (3 credits)

Summer 1:

While it is not required to be at Stony Brook during the summer this is a good time to do a reading project, go to Simons Center talks and study for the comps. Enroll for PHY800 Summer research for 0 credits.

Semester 3:

PHY 540 Statistical Mechanics (3 credits)
PHY 611 Quantum Field Theory II (3 credits)
PHY xxx Elective (3 credits)

Semester 4:

PHY 585 Special Study (1 credit) (International students require permission from VIS to underload, it is typically granted)

Sample Schedule III

SCHEDULE III - PROGRAM FOCUSED ON PRACTICAL SKILLS WITH MASTER THESIS RESEARCH

This is a good option to build practical skills and research experience that could be applied in either further academic research or in real world applications.

Semester 1:

PHY501 Classical Mechanics/ PHY 511 Quantum Mechanics I/PHY540 Statistical Mechanics (3 credits)

PHY 514 Current Research Instruments (3 credits)

PHY 515 Methods of Experimental Research (3 credits)

PHY xxx Elective (3 credits)

Semester 2:

PHY 504 Computational Methods (3 credits)

PHY 546 Python (1 credit)

PHY 598 PHY 599 Graduate Seminar (1 credit)

PHY 580 Special Research Project (4 credits)

PHY xxx Elective (3 credits)

Summer 1:

While it is not required to be at Stony Brook during the summer it can be an excellent opportunity to make significant progress on your research project. Enroll for PHY800 Summer research for 0 credits.

Semester 3:

PHY 604 Computational Methods II (3 credits)

PHY 595 Master Thesis Research (6 credits)

Semester 4:

PHY 595 Master Thesis Research (1 credit) (International students require permission from VIS to underload, it is typically granted)

Sample Schedule IV

SCHEDULE IV - THIS SEQUENCE INCLUDES AN ADVANCED GRADUATE CERTIFICATE IN DATA AND COMPUTATIONAL SCIENCE

Note: This track requires a full time 4th semester

Courses in *Italics* are required for the **Certificate**. Students should ensure that at least one of the PHY electives they take is listed on the **Certificate Course Catalog** [\[PDF\]](#)

Semester 1:

PHY 503 Mathematical Physics (3 credits)

PHY 501 or PHY 511 (3 credits) (Physics emphasis) or PHY52x (3 credits) (Astronomy emphasis)

PHY Elective (3 credits)

JRN 501 Communicating Science I (1 credit)

PHY 598/599 Graduate Seminar (1 credit)

Semester 2:

PHY 504 Computational Methods in Physics and Astrophysics I (3 credits) or AMS 561 Data and Computational Science (3 credits)

PHY 546 Python (1 credit)

PHY 505 or PHY 512 (3 credits) (Physics emphasis) or PHY52x (3 credits) (Astronomy emphasis)

PHY 580 Special Research Project involving computation (3 credits)

JRN 503 Communicating Science II (1 credit)

PHY 598/599 Graduate Seminar (1 credit)

Semester 3:

PHY 604 Computational Methods in Physics and Astrophysics II (3 credits)

CS xxx Elective in Computer Science (3 credits) or AMS xxx Elective in Applied Math (3 credits)

PHY 595 Master Thesis Research involving computation (3 credits)

Semester 4:

PHY 595 Master Thesis Research involving computation (3 credits)

CS xxx Elective in Computer Science (3 credits) or AMS xxx Elective in Applied Math (3 credits)

PHY xxx Elective (3 credits)

Graduate courses offered this semester

Time	Course Number	Course Title	Instructors
10:30	PHY 501	Classical Mechanics	Paul Goldbart
10:35	PHY 503	Methods of Mathematical Physics	Sergey Syritsyn
10:40	PHY 511	Quantum Mechanics I	Sasha Abanov
10:45	PHY 540	Statistical Mechanics	Tom Allison
10:50	PHY 598	Graduate Seminar I: Condensed Matter, AMO, Accelerator	Cyrus Dreyer, Navid Vafaei Najafabadi, Jesus Perez Rios
10:55	PHY 599	Graduate Seminar II: Nuclear, High Energy, Astro	Jan Bernauer, Xin Qian, Kenneth Lanzetta
11:00	PHY 514	Current Research Instruments	Tom Weinacht
11:05	PHY 515	Methods of Experimental Research (Grad Lab)	Mengkun Liu, Xu Du, Eden Figueroa, Clark McGre
11:10	PHY 517	Lab Course in Astronomical Technology (Astro Lab)	Simon Birrer
11:15	PHY 521	Stars	Mike Zingale
11:20	PHY 560	Frontiers of Physics and Astrophysics	Barry Barish
11:25	PHY 688	Special Topics in Astrophysics: General Relativity and Astronomy Applications	Neelima Sehgal
11:30	PHY 555	Solid State Physics I	Dmitri Averin
11:35	PHY 558	Physical Biology	Gabor Balazsi
11:40	PHY 562	Atomic Physics and Lasers	Hal Metcalf
11:45	PHY 568	Quantum Information Science	Tzu-Chieh Wei
11:50	PHY 554	Accelerator Physics	Vladimir Litvinenko
11:55	PHY 695	Cryogenic Systems and their Design	Vladimir Litvinenko
12:00	PHY 604	Computational Methods II	Cyrus Dreyer
12:05	PHY 611	Quantum Field Theory II	Patrick Meade
12:10	PHY 612	Theoretical Particle Physics	Rouven Essig
12:15	PHY 622	String Theory	Martin Rocek, Peter van Nieuwenhuizen, Shu-Heng Shao
12:20	PHY 655	Advanced Graduate Seminar	Martin Rocek
12:25	PHY 680	Special Topics in Theoretical Physics: Non-perturbative Advanced QFT	Leonardo Rastelli
12:30	PHY 680	Special Topics in Theoretical Physics: Group Theory	Peter van Nieuwenhuizen

Remedial Courses

PHY 571, PHY 573, PHY 576, PHY 578 are renumbered undergraduate courses and do not count towards the requirements of a Ph.D. degree. They do however count as credit for an MA or MAT (Master of Arts in Teaching) degree.

You may want to take these courses if you did not have an undergraduate course in these subjects, or you did have such a course, but do not feel it adequately prepared you to take graduate courses.

As they are courses designed to train teachers, in addition to taking the undergraduate course, students are required to make a presentation aimed at teaching the subject of the course to high school students.

Deadlines

- **Sunday August 27** You must have registered for at least one credit by midnight of this date.
- **Monday August 28** First Day of Classes
- **Sunday September 3** Last day to drop credits without tuition liability. After this date you will have to pay a percentage of the tuition for dropped credits. You can still swap classes and if you maintain the same total credits you will not incur new tuition charges.
- **Monday September 4** Labor Day Holiday
- **Monday September 11** (4pm) Deadline to Add, Drop or Swap classes on Solar
- **Monday September 18** (4pm) Last Swaps by Petition.

After 9/18 if you change courses, you will have a W on your transcript and have to pay tuition for both the dropped class and the added class. International students and employed students must maintain a full 9 credit load!