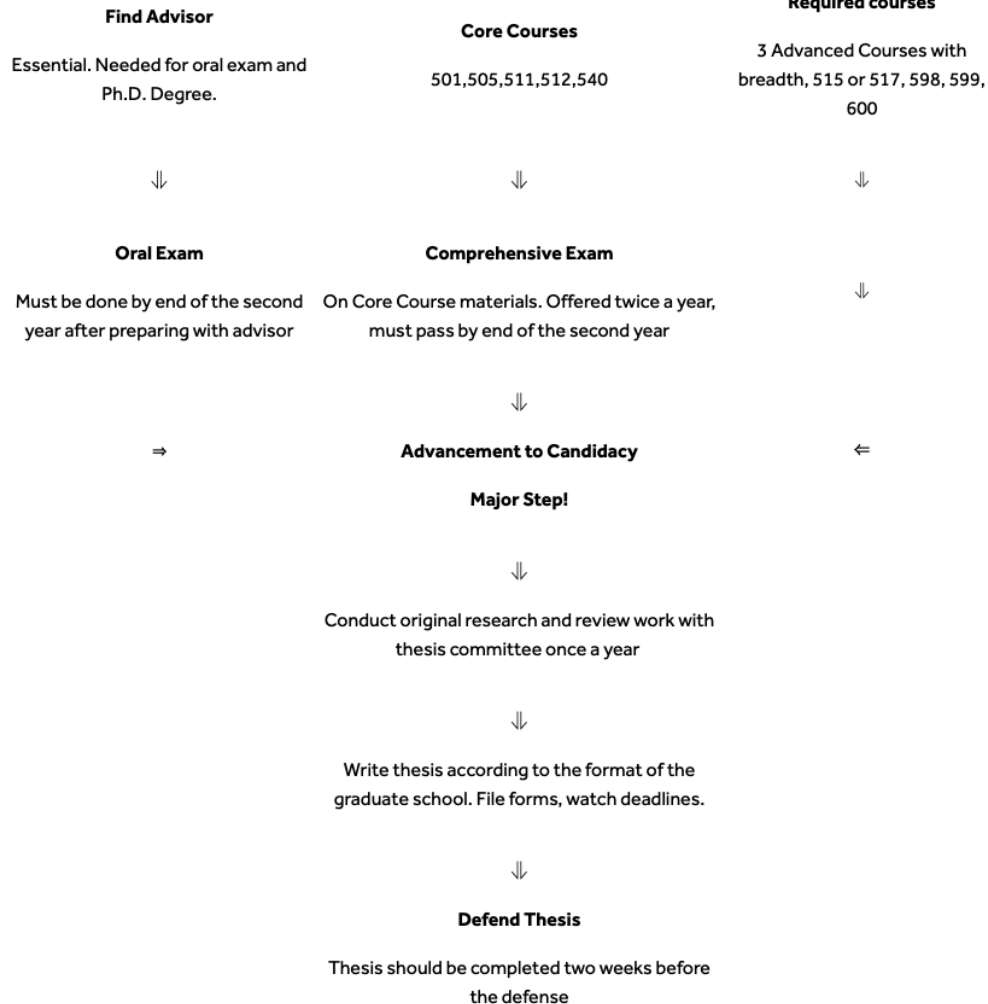


PhD Program requirements and Course choices

Matt Dawber, GPD, August 22, 2019

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.

At the end of the second year all students should have an advisor.

- Year 3: Spend all your time on research.
- Year 4: Spend all your time on research. Many students author their first paper during this year.
- Year 5: Start thinking about your dissertation. Many theory students get their PhD degree at the end of the fifth year.
- Year 6: Most experimental students get their PhD degree during this year.

Advancement to candidacy

A student is advanced to candidacy if all graduate school and departmental requirements other than the dissertation are completed. The Graduate Program Director sends a written notice to the Dean of the Graduate School to recommend advancement to candidacy which is then granted by the Dean of the Graduate School. Students must advance to candidacy at least one year before defending their thesis.

Exams

Comprehensive Exam: This exam is offered twice a year. Most students pass it after their second, third or fourth semester, but you can take it right away. It covers the core courses. Each subject can be passed separately.

Placement Exam: This is the same exam as the comprehensive exam but students have to pass all three problems in a given subject while the passing level is higher.

Oral Exam: The oral exam consists of a presentation of some approved and interesting topic in physics or astronomy to a committee of three faculty members and should be prepared with the guidance of one of them. Usually that person is going to be your advisor.

Failed an Exam?

- Placement Exam: No problem, just take the course(s)
- 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.
- The Comprehensive Exam: Take it again.
- The Comprehensive Exam at the beginning of the fifth semester: Make sure you have an advisor; They may argue your case before the faculty to set up a special oral exam.

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 an Advising Committee appointed by the Graduate Program Director). You should have already emailed me or Jac about this before coming here.

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

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 Physics: 565, 566, (690)
- Accelerator Physics: 554, 543, 564
- Solid State Physics: 555, 556, (681)
- Nuclear Physics: 551, 552, (684)
- Particle Physics: 557, 612, 613, (686)
- Physical Biology: 558, 559, (687)
- Theoretical Physics: 541, 610, 611, 620, 621, (680, 681, 685)
- Computational Methods: 504, 604

Default Course Plan

First Semester	Second Semester
PHY 501 (Classical Mechanics)	PHY 505 (Electrodynamics)
PHY 503 (Mathematical Methods)	PHY 515 (Graduate Lab)
PHY 511 (Quantum Mechanics I)	PHY 512 (Quantum Mechanics II)
PHY 585 (Supplemental QM)	PHY 585 (Supplemental EM)
PHY 598/9 (Graduate Seminar)	PHY 598/9 (Graduate Seminar)
PHY 600 (Teaching)	PHY 600 (Teaching)
PHY 698 (Colloquium)	PHY 698 (Colloquium)

PHY 540 (Statistical Mechanics) can be taken in first (for well-prepared students) or in the third semester. The supplemental course is strongly recommended, in particular if your undergraduate grade in QM or EM was B+ or less at a large institution or A- or less at a small institution.

Astronomy Track

First Semester	Second Semester	Third Semester	Fourth Semester
PHY 521 (Stars) PHY 503 (MM) PHY 540 (SM) PHY 598/9 (Seminar) PHY 600 (Teaching) PHY 698 (Colloquium)	PHY 524 (Cosmology) PHY 505 (EM) PHY 585 (supp) PHY 598/9 (Seminar) PHY 600 (Teaching) PHY 698 (Colloquium)	PHY 523 (Galaxies) PHY 501 (CM) PHY 511 (QM1) PHY 585 (supp) PHY 517 (Astro Lab) PHY 698 (Colloquium)	PHY 522 (Interstellar Medium) PHY 512 (QM II) PHY 698 (Colloquium)

Other plans for core courses

Postponing Statistical Mechanics

F1	S1	F2	S2
501 (CM)	505 (EM)	540 (SM)	
503 (MM)	515 (Lab)		
511 (QM)	512 (QM)		

If you did not have a proper undergraduate QM course, take our undergraduate QM course first (PHY 578 – renumbered as graduate course). This course does not count as credit towards your Ph.D.. If you need to take an undergraduate courses in CM, EM or SM, then you can take are renumbered undergraduate courses PHY 573, PHY 571 and PHY 578, respectively.

Taking the Core Courses at a slower pace

F1	S1	F2	S2
501 (CM)	505 (EM)	511 (QM)	512 (QM)
	585(Supp)		
503 (MM)	515 (Lab)	540 (SM)	

F1	S1	F2	S2
501 (CM)	505 (EM)	511 (QM)	512 (QM)
503 (MM)	515 (Lab)	540 (SM)	
	578 (QM)		

For Advanced Students

F1	S1	F2	S2
501 (CM) 540 (SM) 515 (Grad Lab) 680 (Group Theory) 598 (Graduate Seminar) 600 (TA)	610 (QFT1) 620 (Gen Rel) 613 (Advanced Particle Physics) 680 (Quantum Computing) 599 (Graduate Seminar) 600 (TA)		

Doing the required courses as soon as possible

F1	S1	F2	S2
540 (SM) 515 (Graduate Lab) 680 (Group Theory) 558 (Physical Biology) 598 (Graduate Seminar) 600 (TA)	556 (Solid State II) 620 (Gen Rel) 610 (QFT1) 551 (Nuclear Physics 1) 599 (Graduate Seminar) 600 (TA)		

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	Second Semester	Third Semester	Fourth Semester
PHY 501 (CM)	PHY 512 (QM II)	PHY 540 (SM)	Life Science
PHY 511 (QM I)	PHY 505 (EM)	Life Science	PHY 665
PHY 558 (Physical Biology)	PHY 559 (Bio-Dynamics)	PHY 665 (Journal Club)	PHY 584
PHY 600 (Teaching)	PHY 600 (Teaching)	PHY 584 (Lab Rotation)	Elective
	PHY 561 (Bio-Intro)	Elective	Elective
PHY 698 (Colloquium)	PHY 698	PHY 698	PHY 698

Course Registration

Most PhD students will register for the following courses:

- PHY 501, Classical Mechanics (3 credits)
- PHY 503, Mathematical Methods (3 credits)
- PHY 511, Quantum Mechanics (3 credits)
- PHY 585, Supplemental Quantum Mechanics (1-3) credits
- PHY 598/599, Graduate Seminar (1 credit)
- PHY 600, Teaching Practicum (1 credit) (this is your TA assignment and is not a real class)
- PHY 698, Colloquium (1 credit) (you are strongly urged to come to the colloquium each week).

Exceptions:

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

Graduate courses offered this semester

Derek Teaney, Classical Mechanics, PHY 501

Ismail Zahed, Mathematical Methods, PHY 503

Dima Averin, PHY 511, Quantum Mechanics

Vladimir Goldman, Supplemental QM

Hal Metcalf, Instrumentation, PHY 514

Hal Metcalf, Lasers and Modern Optics, PHY 562

Mengkun Liu, Graduate Lab, PHY 515

Anja von der Linden, Astronomy Lab, PHY517

Alan Calder, Stars, PHY 521

Sergey Syritsyn, Statistical Mechanics, PHY 540

Marivi Fernandez Serra, Solid State Physics I, PHY 555

Tom Weinacht, Quantum Electronics II, PHY 566

Gábor Bálazsi, Physical Biology, PHY 558

Will Farr, Computational Methods II, PHY604

Leonardo Rastelli, Quantum Field Theory II, PHY 611

Rouven Essig, Theoretical Particle Physics, PHY 612

Warren Siegel, String Theory, PHY 622

Peter van Nieuwenhuizen, Introduction to Modern Theoretical Physics, PHY 680

Jac Verbaarschot, Topics in Nuclear Physics, PHY 684

Remedial Courses

PHY 571, PHY 573, PHY 576, PHY 578 are renumbered undergraduate courses and do not count as credit for a Master or Ph.D. degree. You may want to take these courses if you did not have an undergraduate course in these subjects. They do however count as credit for an MAT (Master of Arts in Teaching) degree.

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 sought	Credits
G1	< 24	Master	12-18
G2	\geq 24	Master	9
G3	< 24	Ph.D.	12-18
G4	\geq 24	Ph.D.	9
G5	all reqs	Ph.D.	9

Many courses are offered with variable credits (see graduate bulletin). By adjusting credits, you can get the right total number of credits.

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.

Examples

Status							Total
G1	501: 3	505: 3	511: 3	599: 1	600: 1	698: 1	12
G3	501: 3	505: 3	511: 3	599: 1	620: 3	698: 1	14
G4	501: 3	505: 3	511: 3		600: 0		9
G5	676: 1	698: 1	699: 7				9

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

After having 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.

Deadlines

- **August 25th** You must have registered for at least one credit by midnight of this date – otherwise it will cost you real money.
- **August 26th** First Day of Classes
- **September 2nd** Labor Day Holiday
- **September 9th** (4pm) Deadline to Add, Drop or Swap classes

Full Calendar at:

https://www.stonybrook.edu/commcms/registrar/calendars/_graduate-calendar-fall-2019.php