Physics and Astronomy Plans of Study

A typical path through the Physics major

First year:

Fall: PHYS 005: Spacetime, and Quanta

Spring: PHYS 013: Thermodynamics/Statistical Mechanics (0.5 cr)
PHYS 015: Optics (0.5 cr)

Second year:

Fall: PHYS 007: Introductory Mechanics
PHYS 063: Procedures in Experimental Physics (0.5 cr)

Spring: PHYS 008: Electricity and Magnetism
PHYS 017: Mathematical Methods of Physics (0.5 cr)
PHYS 018: Quantum Mechanics (0.5 cr)

Third year:

Fall: †PHYS 111: Analytic Dynamics
†PHYS 112: Electrodynamics — or fourth year

Spring: †PHYS 113: Quantum Theory
†PHYS 114: Statistical Physics — or fourth year
PHYS 081: Advanced Laboratory I (0.5 cr)

Fourth year:

Fall: PHYS 082: Advanced Laboratory I (0.5 cr)
*PHYS 13x: Elective seminar, or PHYS 112
PHYS 097 (senior conference) for course majors
*PHYS 180: Thesis

Spring: *PHYS 13x: Elective seminar, or PHYS 114

*not required for the major

†Three of PHYS 111-114 are required for the major, along with a fourth full semester of advanced work in our department. Students can meet that requirement by taking all four; by taking three plus an elective seminar (13x) or an astrophysics seminar (100-level); or by a full credit of research or journal club. All four are strongly recommended for students pursuing graduate work in physics.

This represents a typical path through the major for a student who starts in Physics 5 as a first-year student. Completing all four of Physics 111-114 during junior year represents a *rapid* pace through the major, meeting nearly all the major requirements by the end of the third year. Many alternate schedules are possible. It is common to delay 112 and/or 114 to senior year; and sometimes to delay some of 13, 15, 17, and 18. Permission of the instructor is required to take Phys 111 without Phys 17 or the equivalent math courses (Math 43 or 44; Math 54 is also required to replace Phys 17).

Elective seminars (13x) offered recently include General Relativity (130), Solid State Physics (135), Plasma Physics, Cosmological Physics (137), and Biological Physics (139). They are not required for the major, but taking at least two is strongly recommended, especially for a student intending to go on to graduate study.

Some of the astronomy courses, for example ASTR 14 (Astrophysics: Solar System and Cosmology), ASTR 16 (Astrophysics: Stars, ISM, and Galaxies), and ASTR 61 (Current Problems in Astrophysics, 0.5 cr) are sometimes taken as electives.

Study abroad is possible for astro/physics majors, but it is usually important that the some of the courses taken abroad count toward the major.

The course major and honors major requirements for classes, seminars, and labs are identical. All 100-level classes are taught as seminars. Senior thesis is an option for students in the honors program; non-thesis research can be pursued during the semester via ASTR/PHYS 94. Really, the only difference between the course and honors major curricula are the external exams and the opportunity to write an honors thesis.

All majors, regardless of their participation in the honors program, are encouraged to participate in research one summer or semester.

Astrophysics and Astronomy are two additional majors offered by our department. Because you can't minor in something within your major department, you can't major in Physics and minor in Astro. The functional equivalent of that is the Astrophysics major, which requires all the classes required for the physics major except PHYS 63, 81, and 82, and also requires ASTR 16 and two 100-level astronomy seminars. (One of the two astronomy seminars can also count as the fourth physics seminar, so an Astrophysics major may take only three physics seminars.) The 20-credit rule is waived for astrophysics majors.

The Astronomy major shares nearly the first four semesters in common with the Physics major, but then requires ASTR 014, ASTR 016, ASTR 61, and the three 100-level Astronomy seminars offered at Swarthmore. An advanced astronomy course from Haverford or Bryn Mawr can be substituted for one of ASTR 014 or ASTR 016; a student wishing to make this substitution should confirm in advance that the selected course is acceptable for this purpose.

Typical courses of study for these two majors are listed on the following pages.

The typical course of study for the Astrophysics major

First year:	
Fall:	PHYS 005: Spacetime and Quanta
Spring:	PHYS 013: Thermodynamics/Statistical Mechanics (0.5 cr)
	PHYS 015: Optics (0.5 cr)
	ASTR 014: Astrophysics: Solar System and Cosmology
	(note that either ASTR 014 or ASTR 016 are required for the major, but not both)
Second year:	
Fall:	PHYS 007: Introductory Mechanics
	ASTR 016: Astrophysics: Stars, ISM, and Galaxies
Spring:	PHYS 008: Electricity and Magnetism
	PHYS 017: Mathematical Methods of Physics (0.5 cr)
	PHYS 018: Quantum Mechanics (0.5 cr)
Third year:	
Fall:	†PHYS 111: Analytic Dynamics
	†PHYS 112: Electrodynamics
	†ASTRO 121: Research Techniques in Observational Astronomy
Spring:	†PHYS 113: Quantum Theory
	*ASTR 61: Current Problems in Astronomy and Astrophysics (0.5 cr)

Fourth year:
Fall: †ASTR 123: Stellar Astrophysics
*ASTR 180: Thesis
Spring: †PHYS 114: Statistical Physics
†ASTR 126: Interstellar Medium

*not required for the major (note also that only one of ASTR 14 and ASTR 16 is required for the major)
†Three of PHYS 111-114 and two ASTR 100-level seminars are required for the major. Sometimes PHYS 130 or PHYS 137 can be counted as ASTR seminars depending on how they fit into the overall program; students wishing to make this substitution must receive permission of the department. Students pursuing graduate work in astrophysics are strongly encouraged to confer with faculty about what set of 100-level offerings will make for a strong application.

The typical course of study for the Astronomy major

First year:
Fall: PHYS 005: Spacetime and Quanta
Spring: *PHYS 013: Thermodynamics/Statistical Mechanics (0.5 cr)
ASTR 014: Astrophysics: Solar System and Cosmology

Second year:
Fall: PHYS 007: Introductory Mechanics
Spring: PHYS 008: Electricity and Magnetism
*PHYS 017: Mathematical Methods of Physics (0.5 cr)
*PHYS 018: Quantum Mechanics (0.5 cr)

Third year:
Fall: ASTR 016: Astrophysics: Stars, ISM, and Galaxies
ASTR 121: Research Techniques in Observational Astronomy
Spring: *PHYS 015: Optics (0.5 cr)
ASTR 61: Current Problems in Astronomy and Astrophysics (0.5 cr)

Fourth year:
Fall: ASTR 123: Stellar Astrophysics
*ASTR 180: Thesis
Spring: ASTR 126: Interstellar Medium
*ASTR 61: Current Problems in Astronomy and Astrophysics (0.5 cr)

*Not required for the major; although PHYS 13 and 15 are prerequisites for certain astronomy seminars, and PHYS 17 and 18 are recommended. ASTR 61 can be taken for credit more than once.

9.1 Bachelor of Arts and Bachelor of Science

The degree of Bachelor of Arts or Bachelor of Science is conferred by faculty vote upon students who have met the following requirements for graduation:

1. Completed 32 course credits or their equivalent.
2. An average grade of at least C in the Swarthmore courses counted for graduation (see section 8.2.6). A student with more than 32 credits may use the Swarthmore credits within the highest 32 for the purposes of achieving the C average.
3. Complied with the distribution requirements and have completed at least 20 credits outside one major subject (see section 7.2).
4. Fulfilled the foreign language requirement, having either: (a) successfully studied 3 years or the "block" equivalent of a single foreign language during grades 9 through 12 (work done before grade 9 cannot be counted, regardless of the course level); (b) achieved a score of 600 or better on a standard achievement test of a foreign language; (c) passed either the final term of a college-level, yearlong, introductory foreign language course or a semester-long intermediate foreign language course; or (d) learned English as a foreign language while remaining demonstrably proficient in another.
5. Met the requirements in the major and supporting fields during the last 2 years. (For requirements pertaining to majors and minors, see section 7.4).
6. Passed satisfactorily the comprehensive requirement in the major field or met the standards set by visiting examiners in the Honors Program.
7. Completed four semesters of study at Swarthmore College. Two of these must constitute the senior year (i.e., the last two full-time semesters of degree work), with the exception that seniors during the first semester of their senior year, with the approval of the chair(s) of their major department(s), may participate in the Swarthmore Semester/Year Abroad Program. (For more information regarding the senior year rule, see section 7.6.1).
8. Completed the physical education requirement set forth in the Physical Education and Athletics Department statements.
9. Paid all outstanding bills and returned all equipment and library books.