

# *Physics and Astronomy Plans of Study*

## **A typical path through the Physics major (updated January 2025)**

First year:

- Fall:           PHYS 005: The World of Particles and Waves  
Math according to placement, in order to complete Math 033 or 034 before Phys 008
- Spring:       PHYS 006: Foundations of Contemporary Physics  
Math according to placement

Second year:

- Fall:           PHYS 007: Introductory Mechanics  
PHYS 063: Procedures in Experimental Physics (0.5 cr)  
Math according to placement
- Spring:       PHYS 008: Electricity and Magnetism  
*Note that Math 33 or 34 is a prerequisite for Phys 008 — occasionally permission may be given to take Math 34 concurrently with Phys 008 but this permission must be obtained by the start of the semester in which Phys 007 is taken*  
PHYS 064: Techniques for Scientific Computing (0.5 cr)

Third year:

- Fall:           †PHYS 107: Quantum Theory  
†PHYS 112: Electrodynamics — or fourth year
- Spring:       †PHYS 111: Analytic Dynamics  
†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 094 (research for credit) or PHYS 180 (Honors thesis)
- Spring:       \*PHYS 13x: Elective seminar, or PHYS 114  
\*PHYS 094 (research for credit)

\*not required for the major

†PHYS 107 and two of PHYS 111, 112, and 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, along with Advanced Quantum Mechanics (PHYS 115, offered alternate years in the spring) are strongly recommended preparation for physics PhD programs.

This represents a possible path through the major for a student who starts in Physics 5 as a first-year student. Completing all four of Physics 107, 111, 112, and 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 either 111 or 114 to senior year. Sophomores seeking to make rapid progress and who earned a grade of A in Physics 7 could take Phys 111 in addition to Phys 8 during spring of sophomore year.

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 one is strongly recommended as preparation for PhD programs.

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 some of the courses taken abroad count toward the major.

The course major and honors major requirements for classes, seminars, and labs are identical. 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 also counts as the fourth physics seminar, so an Astrophysics major is required to take 5 seminars total.) The 20-credit rule is waived for Astrophysics.

The Astronomy major shares most of 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.

### **A typical course of study for the Astrophysics major**

First year: *also see math as noted with the Physics major*

Fall: PHYS 005: The World of Particles and Waves

Spring: PHYS 006: Foundations of Contemporary Physics

\*ASTR 014: Astrophysics: Solar System and Cosmology

*(note that ASTR 014 is an elective, not required for the major)*

Second year:

Fall: PHYS 007: Introductory Mechanics

ASTR 016: Astrophysics: Stars, ISM, and Galaxies

Spring: PHYS 008: Electricity and Magnetism

PHYS 064: Techniques for Scientific Computing (0.5 cr)

Third year:

Fall: †PHYS 107: Quantum Theory

†ASTR 123: Stellar Astrophysics (offered alternate years)

Spring: †PHYS 114: Statistical Physics  
†ASTR 126: Interstellar Medium (offered alternate years)  
\*ASTR 61: Current Problems in Astronomy and Astrophysics (0.5 cr)

Fourth year:

Fall: †PHYS 112: Electrodynamics  
\*ASTR 180: Thesis

Spring: †PHYS 111, 130, or 137 (depending on offerings)

\*not required for the major (note also that only one of ASTR 14 and ASTR 16 is required for the major)  
†PHYS 107, two of PHYS 111, 112, and 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.

### **A typical course of study for the Astronomy major**

First year: *also see math as noted with the Physics major*

Fall: PHYS 005: The World of Particles and Waves

Spring: PHYS 006: Foundations of Contemporary Physics  
ASTR 014: Astrophysics: Solar System and Cosmology

Second year:

Fall: PHYS 007: Introductory Mechanics

Spring: PHYS 008: Electricity and Magnetism  
PHYS 064: Techniques for Scientific Computing (0.5 cr)

Third year:

Fall: ASTR 016: Astrophysics: Stars, ISM, and Galaxies  
ASTR 121: Research Techniques in Observational Astronomy (offered alternate years)

Spring: ASTR 61: Current Problems in Astronomy and Astrophysics (0.5 cr)

Fourth year:

Fall: ASTR 123: Stellar Astrophysics (offered alternate years)  
\*ASTR 180: Thesis

Spring: ASTR 126: Interstellar Medium (offered alternate years)  
\*ASTR 61: Current Problems in Astronomy and Astrophysics (0.5 cr)

\*ASTR 14 is not required for the major, but can substitute for the fourth Astronomy seminar; alternatively, advanced astronomy courses at Haverford or Bryn Mawr can be taken, or Physics 107, Physics 130 or 137 can substitute for the fourth Astronomy seminar (note Physics 130 and 137 have additional physics prerequisites). 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.