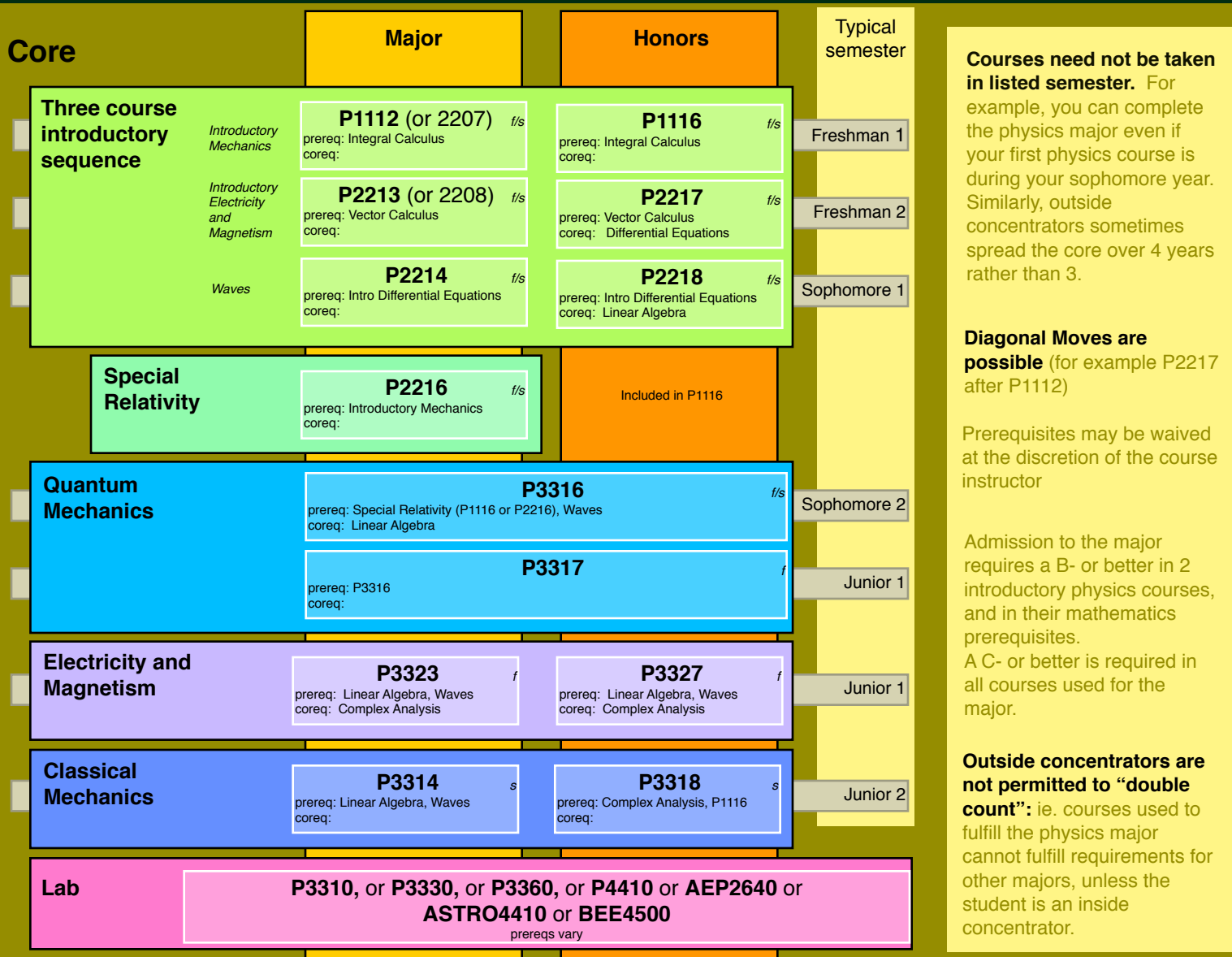


Cornell Undergraduate Physics Major



Courses need not be taken in listed semester. For example, you can complete the physics major even if your first physics course is during your sophomore year. Similarly, outside concentrators sometimes spread the core over 4 years rather than 3.

Diagonal Moves are possible (for example P2217 after P1112)

Prerequisites may be waived at the discretion of the course instructor

Admission to the major requires a B- or better in 2 introductory physics courses, and in their mathematics prerequisites.

A C- or better is required in all courses used for the major.

Outside concentrators are not permitted to “double count”: i.e. courses used to fulfill the physics major cannot fulfill requirements for other majors, unless the student is an inside concentrator.

Concentration

Inside Concentrator	Outside Concentrator
PHYS 4410 (in addition to core lab) 11 more credits from: PHYS3000+, ASTRO 3332, ASTRO 4431-2, or AEP 4340. no more than 8 credits from PHYS4490	15 credits in concentration (coherent program of study complementing core) Examples: Astronomy, Life Sciences, Mathematics, Education, Computer Science, Science Technology and Society, Music/Acoustics, Philosophy, Public Policy, History of Science, Chemistry, Science Writing, Art History, Economics, Sustainability, Meteorology, Geology, Law 8 credits must be at 3000+ level

Mathematics

Students from any college may take courses from any of the Math streams, and can freely mix streams

	Integral Calculus	Vector Calculus	Intro Diff. Eqns.	Linear Algebra	Complex Analysis*	Diff. Eqns*	*Not required for Outside Concentrators AEP courses are a good option for all streams
Engineering (typical sequence)	MATH 1910	MATH 1920	MATH 2930	MATH 2940	AEP 4210	AEP 4220	
A&S	MATH 1120	MATH 2220 MATH 2220 may be taken before MATH 2210	MATH 2930	MATH 2210	MATH 4220	MATH 4200	
Honors	MATH 1220	MATH 2240 MATH 2240 may NOT be taken before MATH 2230	see advisor	MATH 2230	MATH 4180	MATH 4200	
Other	4+ on AP Calc. BC	MATH 2130	MATH 3230	MATH 2310	TAM 3110	MATH 3230/4250/4280 TAM 3100	

Computer Science

No formal CS requirement. Recommend CS 1112 or CS 1132 or ASTRO 3340.

Cornell Undergraduate Physics Minor

Introductory sequence with Special Relativity (12-13 credit)

Introductory Mechanics

P1112 or 2207 or 1116
prereq: Integral Calculus

Special Relativity

P2216 or P1116
prereq: Introductory Mechanics

Introductory Electricity and Magnetism

P2213 or 2208 or 2217
prereq: Vector Calculus

Waves

P2214 or 2218
prereq: Differential Equations

P1116 may simultaneously satisfy both the mechanics requirement and the special relativity requirement

Advanced placement or transfer credit can be used to satisfy these requirements.

Intermediate Level Physics (3 courses, 9 credits)

Quantum Mechanics

P3316

prereq: Special Relativity (P1116 or P2216), Waves
coreq: Linear Algebra

Students with credit for another quantum mechanics class (ex. AEP 3610, CHEM 2870-2880 or ECE 4060) may substitute another Physics course numbered 3000 or higher

Lab

P3310, or P3330, or P3360, or P4410 or ASTRO 4410 or experimental research as P4490

Other

1 or more physics courses at the 3000+ level to meet the requirement of 3 courses, 9 credits

Students in majors that require physics courses at the 3000 level or higher, such as Applied and Engineering Physics, Astronomy, or Mathematics, may not use courses to satisfy both their major and the physics minor.

No more than 3 credits of Physics 4490 may count towards the minor

Admission to the minor requires a B- or better in 2 introductory physics courses, and in their mathematics prerequisites. A C- or better is required in all courses used for the minor.

More information about Concentrations

- The Concentration must complement the Core. The narrative behind this can vary. Some examples include
 - Astronomy: Applying physical concepts to study astrophysical phenomena
 - Public Policy: Working on issues such as nuclear proliferation or sustainability requires a technical background
- The Concentration must have internal coherence.
- There are no set courses. The student should develop a sensible program of study in consultation with their advisor and the director of undergraduate studies. Two students with the same concentration may have very different course sets. For example a life sciences concentrator may be interested in applying physics to medical instrumentation. Such a student may use the biology and chemistry classes needed for medical school as their concentration. Another life science student may be interested in biophysics research, and hence focus on courses which develop biophysics lab skills.

Partial list of Courses with Physics Content

Physics -- The physics department offers a full range of undergraduate and graduate classes. As a supplement to their introductory sequence, freshmen may enjoy PHYS 1117 Concepts of Modern Physics. Upperclassmen interested in becoming research physicists would benefit from supplementing the core with: PHYS 3341 Statistical Physics (typically taken in the spring of your senior year), PHYS 4443 Quantum Mechanics (typically taken in the spring of your junior or senior year). Other advanced courses include: Lab courses (PHYS 3310/3360/4410), PHYS 4444 Particle Physics, PHYS 4454 Solid-State Physics, PHYS 4455 Geometric Concepts in Physics, PHYS 4456/4487/4488 Accelerator Physics, PHYS 4480 Computational Physics, and PHYS 4481 Quantum Information Processing. Students often perform research for course credit by taking PHYS 4490 or PHYS 4491, the latter is a formal course on Data Analysis in Particle Physics requiring introductory mechanics as a prerequisite. Advanced undergraduate students occasionally enroll in graduate courses (typically, but not limited to, PHYS 6572 or 6599).

Applied Physics -- Cornell's applied physics department offers a number of courses which complement those offered by physics. These include AEP 1100 Lasers and Photonics, AEP 1200 Nanoscience, AEP 3240 Maple Supplement to Mathematical Physics, AEP 3330 Mechanics of Particles and Solid Bodies, AEP 4230 Statistical Thermodynamics, AEP 4340 Continuum Physics, AEP 4440 Quantum and Nonlinear Optics, AEP 4840 Fusion, and the AEP courses listed below under "Biology."

Astronomy -- Introductory astronomy courses particularly appropriate to physics majors: ASTRO 2211 Extrasolar, ASTRO 2212, Solar, ASTRO 2233 Special Topics, ASTRO 2290 Relativity. Any astronomy course labelled 3000+ should also be considered (many have no astronomy prerequisites).

Applied Mathematics -- Physics heavily draws on applied mathematics such as Calculus, Differential Equations, Complex

Analysis, and Differential Geometry. In addition to looking at courses offered by the Mathematics department, students may find it useful to look at the courses offered by Theoretical and Applied Mechanics. Please see an advisor for help on selecting mathematics courses.

Abstract Mathematics -- Students with an interest in abstract mathematics should consider taking courses in real analysis and abstract algebra. Other major branches of abstract mathematics include Differential Geometry, Topology, and Number Theory.

Biology -- Physics is important in understanding micro and macro biology, and has application in areas such as bioinformatics. Physics is also a major part of bio-instrumentation. Biology related courses some physics flavor include: AEP 2520/5520 Physics of Life, AEP 4700/5710 Biophysical methods, BEE 3310 Bio-Fluid Mechanics, BEE 4500 Bioinstrumentation, BEE 4590 Biosensors, BME 1310 Biomedical Engineering, BME 5030 Biomedical Instrumentation, BIONB 4960 Bioacoustic Signals in Animals and Man. Introductory Biology (BIOG 1101-1104) are naturally incorporated into a well-rounded science education.

Communication/Writing -- Technical writing skills are essential to success in physics. General technical writing courses: ENGL 2880/2890, ENGR 3350/3500, BEE 4930, BEE 4890, COMM 2630. Science journalism courses: COMM 3520/3530.

Computers -- Computer skills are essential for success in many areas of physics. Physics students are encouraged to consider an introductory computer science course such as CS 1112, as well as more targeted courses such as PHYS 4480 Computational Physics, AEP 4380 Computational Engineering Physics, CS 3220 Scientific Computing, CS 3200 Engineering Computation, and MATH 4250/60 Numerical Analysis.

Chemistry -- Quantum physics forms the basis of most chemical processes. Chemistry related courses with some physics flavor

include: CHEM3890-3900, CHEM 4840 Microchemical/Microfluidic Systems. Introductory chemistry (CHEM 2070/80/90), and organic chemistry (CHEM 3590-3600) are naturally incorporated into a well-rounded science education.

Earth and Atmospheric Sciences -- Physics can be applied to understanding the Earth and its Atmosphere. Of particular interest to physics students are EAS4470 Physical Meteorology and EAS 4840 Inverse Methods in Natural Sciences.

Education -- PHYS 4484 Teaching and Learning Physics, EDUC 4040/50 Learning and Teaching

Electrical Engineering -- ECE courses of interest to Physics students include: ECE 4300 Lasers, ECE 4330 Microwave Devices, ECE 4370 Fiber

Food Science -- FDSC 2000 Physicochemical and Biological Aspects of Food, FDSC 4230 Physical Principles of Food Preservation, NS 3310 Physiological and Biochemical Bases of Human Nutrition

Government -- PHYS 2206 Weapons of Mass Destruction, GOVT 3091 Science in the American Polity, GOVT 4293 Politics of Science

History, Art History, and Archaeology -- HIST 2810/2820 Science in Western Civilization, HIST 3290 Physical Sciences in the Modern Age HIST 4581 /6410/6800/7110 Seminars, ARTH 6252 Research Methods in Archaeology, ARKEO 4370 Geophysical Field Methods

Law -- LAW 6742 Patent Law

Material Science -- Physics can be applied to understanding the properties of materials. Possible courses include ENGRD 2610 Mechanical Properties of Materials, CEE 3710-20 Structural Modeling, MSE 4100 Physical Metallurgy, MSE 4890 Colloids