### Cornell Undergraduate Physics Major

**Core**

#### Three course introductory sequence
- **Introductory Mechanics**
  - **P1112 (or 2207)** f/s
    - prerequisite: Integral Calculus
    - corequisite: Vector Calculus
  - **P2213 (or 2208)** f/s
    - prerequisite: Vector Calculus
    - corequisite: Differential Equations
- **Introductory Electricity and Magnetism**
  - **P2214** f/s
    - prerequisite: Intro Differential Equations
    - corequisite: Linear Algebra
- **Waves**
  - **P2218** f/s
    - prerequisite: Intro Differential Equations
    - corequisite: Linear Algebra

#### Special Relativity
- **P2216** f/s
  - prerequisite: Introductory Mechanics
  - corequisite: Included in P1116

#### Quantum Mechanics
- **P3316** f/s
  - prerequisite: Special Relativity (P1116 or P2216), Waves
  - corequisite: Linear Algebra
- **P3317**
  - prerequisite: P3316

#### Electricity and Magnetism
- **P3323**
  - prerequisite: Linear Algebra, Waves
  - corequisite: Complex Analysis
- **P3327**
  - prerequisite: Linear Algebra, Waves
  - corequisite: Complex Analysis

#### Classical Mechanics
- **P3314**
  - prerequisite: Linear Algebra, Waves
  - corequisite: Complex Analysis, P1116
- **P3318**
  - prerequisite: Complex Analysis, P1116
  - corequisite: Linear Algebra

#### Lab
- **P3310, or P3330, or P360, or P4410 or AEP2640 or ASTRO4410 or BEE4500**
  - prerequisite varies

### Concentration

#### Inside 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

#### Outside Concentrator
- 15 credits in concentration (coherent program of study complementing core)
  - 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

<table>
<thead>
<tr>
<th>Core Courses</th>
<th>Engineering (typical sequence)</th>
<th>A&amp;S</th>
<th>Honors</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Integral Calculus</strong></td>
<td>MATH 1910</td>
<td>MATH 1120</td>
<td>MATH 1220</td>
<td>4+ on AP Calc. BC</td>
</tr>
<tr>
<td><strong>Vector Calculus</strong></td>
<td>MATH 1920</td>
<td>MATH 2220</td>
<td>MATH 2240</td>
<td>MATH 2130</td>
</tr>
<tr>
<td><strong>Intro Diff. Eqns.</strong></td>
<td>MATH 2930</td>
<td>MATH 2930</td>
<td>see advisor</td>
<td>MATH 3230</td>
</tr>
<tr>
<td><strong>Linear Algebra</strong></td>
<td>MATH 2940</td>
<td>MATH 2210</td>
<td>MATH 2230</td>
<td>MATH 2310</td>
</tr>
</tbody>
</table>

#### Complex Analysis*
- MATH 4210

#### Diff. Eqns*
- MATH 4220

*Not required for Outside Concentrators
AEP courses are a good option for all streams

### Computer Science

No formal CS requirement. Recommend CS 1110 or 1112 or ASTRO 3340.

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” ie. courses used to fulfill the physics major cannot fulfill requirements for other majors, unless the student is an inside concentrator.
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 enroll 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 fall 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 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. Advanced undergraduate students occasionally enroll in graduate courses (typically, but not limited to, PHYS 6572 or 6599).

Introductory Physics

Introductory Mechanics
P1112 or 2207 or 1116
prereq: Integral Calculus

Intermediate Level Physics (3 courses, 9 credits)

Quantum Mechanics
P3316
prereq: Special Relativity (P1116 or P2216), Waves
coreq: Linear Algebra

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

Partial list of Courses with Physics Content

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

1. The Concentration must complement the Core. The narrative behind this can vary. Some examples include
   a. Astronomy: Applying physical concepts to study astrophysical phenomena
   b. Public Policy: Working on issues such as nuclear proliferation, sustainability, or science policy requires a technical background.

2. The Concentration must have internal coherence.

3. 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.

Cornell Undergraduate Physics Minor