

## Physics Department Introductory Course Offerings

### 1201-1202:

- Designed to satisfy pre-med physics requirements.
- Two semesters with concurrent laboratory (1291-1292), if needed.
- Survey course meant to introduce basic concepts, phenomena using rudimentary calculus but with little emphasis on mathematical techniques.
- At least Calculus I as co-requisite in first semester (no further calculus needed).
- From course listing: Basic introduction to the study of mechanics, fluids, waves, electricity, magnetism, optics, quantum mechanics, atomic physics, and nuclear physics.
- This sequence is not suitable for students continuing in physics (major/concentration) or for SEAS students.

### 1401, 1402, 1403:

- Designed to satisfy basic SEAS requirements.
- Three-semester course followed by one semester laboratory course (1494), if selected.
- Thorough introduction to mechanics, thermodynamics, electricity and magnetism (E&M), optics, followed by an introduction to classical and quantum waves.
- Emphasizes quantitative analysis of physical problems and practical application of concepts. Less conceptual development and less mathematical rigor than 160x and 280x sequences.
- At least Calculus I as co-requisite in first semester.
- From course listing:
  - 1401: Fundamental laws of mechanics, kinematics and dynamics, work and energy, rotational dynamics, oscillations, gravitation, fluids, temperature and heat, gas laws, the first and second laws of thermodynamics.
  - 1402: Electric fields, direct currents, magnetic fields, alternating currents, electromagnetic waves, polarization, geometrical optics, interference, and diffraction.
  - 1403: Classical waves and the wave equation, Fourier series and integrals, normal modes, wave-particle duality, the uncertainty principle, basic principles of quantum mechanics, energy levels, reflection and transmission coefficients, applications to atomic physics.

### 1601, 1602, 2601:

- Designed to satisfy physics major and applied physics course requirements.
- Three-semester course followed by optional one semester laboratory (1494), if needed.
- Thorough introduction to mechanics, special relativity, thermodynamics, E&M, optics, followed by an introduction to classical and quantum waves.
- Adds special relativity and more thorough introduction to classical and quantum waves to 140x sequence.
- Emphasizes conceptual foundation of introductory physics along with quantitative analysis and problem solving techniques.

- Uses more advanced mathematical techniques compared to 140x sequence, including a gradual inclusion of vector calculus from the start.
- Appropriate starting point for a degree in physics.
- At least Calculus II as co-requisite in first semester, with the expectation that students continue the calculus sequence concurrently (e.g. at least Calculus III as co-requisite in second semester).
- From course listing:
  - 1601: Fundamental laws of mechanics, kinematics and dynamics, work and energy, rotational dynamics, oscillations, gravitation, fluids, introduction to special relativity and relativistic kinematics.
  - 1602: Temperature and heat, gas laws, the first and second laws of thermodynamics, kinetic theory of gases, basic statistical mechanics, electric fields, direct currents, magnetic fields, alternating currents, electromagnetic waves.
  - 2601: Classical waves and the wave equation, geometrical optics, interference and diffraction, Fourier series and integrals, normal modes, wave-particle duality, the uncertainty principle, basic principles of quantum mechanics, energy levels, reflection and transmission coefficients, the harmonic oscillator.

## 2801-2802

- Accelerated course intended for students with excellent preparation in calculus and introductory physics who intend to pursue a career in physics or applied physics.
- Two-semester course with no laboratory.
- Mathematically rigorous review of mechanics and E&M with thorough introduction to special relativity and rigorous introduction to quantum mechanics.
- Provides a deeper conceptual understanding of material the student is already expected to know. Uses more advanced mathematical techniques (than in 140x and 160x) to formulate the physical principles and to solve problems.
- Intensive course with heavy work load (typically 10-15 hours per week will be required for homework).
- Uses the most rigorous and most challenging introductory textbooks currently available.
- In practice, at least Calculus III as co-requisite in first semester (but see placement information below).
- From course listing:
  - This accelerated two-semester sequence covers the subject matter of PHYS 1601, 1602 and 2601, and is intended for those students who have an exceptionally strong background in both physics and mathematics.
- Enrollment by invitation only. To qualify you must either:
  - Have scored a 5 on the calculus BC AP exam AND have scored at least a 4 on both of the Physics C AP exams and have scored a 5 on one of the Physics C AP exams, or
  - Perform sufficiently well on the placement exam.