

PHYS 1312 – Advanced Introductory Physics II: Optics, Electricity, Magnetism

- ❑ Prerequisites: PHYS 1311 or 1211, MATH 2260 or 2500 or 3500(H)*** also familiarity with college Algebra, Geometry, Trigonometry**, and General Chemistry
- ❑ Not available for students with credit in PHYS 1112?
- ❑ Introduction to Optics, Electricity, and Magnetism using calculus
- ❑ Aims of course:
 - teach you the fundamental principles/laws of physics
 - teach you how to apply these principles to practical problem solving (useful in other fields)

A Building-Up of Principles

Algebra -> geometry -> trigonometry-> kinematics -> forces -> work/energy -> ... -> oscillations/**waves** -> ... -> **optics** -> **electricity/magnetism** -> special relativity -> quantum mechanics ->

Why Optics, Electricity, Magnetism?

- Physics could be defined as the study of energy and matter. Light is a form of energy and is a manifestation of electro-magnetic forces.
- In PHYS 1311 (or 1211), we mostly considered the force of gravity or indirect manifestations of the electro-magnetic force (friction, normal force) or directly (Coulomb force).
- In this course, we will study the fundamental forces of electricity and magnetism.

The Classification of Physics

Classical Physics

- everyday speeds and sizes
(Newton, **Maxwell**,...)

Relativistic Physics

- Very fast (Einstein, ...)

Quantum Physics

- very small
(Schroedinger, ...)

Relativistic Quantum
Physics – very small and
very fast (Dirac, ...)

Introduction and Review

Things you should already know or will need to learn about:

1. Units: SI will be used (mostly), British units will be used rarely (foot, pound...)
2. Significant figures (covered in PHYS 1311 lab)
3. Dimensional analysis
4. Order-of-magnitude estimates
5. Everything from PHYS 1311 including energy quantization and vpython

Wave Properties

- ◆ The particle-wave duality of light:
 - Classical electro-magnetic theory describes light as a wave (Chap. 23)
 - Quantum-mechanically, light is made up of particles, each with some “quanta” or packet of energy – photons (Chap. S3)
- ◆ In this course, we will treat “light” as a wave (mostly)
- ◆ Specifically, light is a transverse, periodic wave
- ◆ You should review Experiments 8 and 9 anything on oscillations from 1311/1211