FHSU Physics Overview

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1 Introduction

This document provides a *brief* overview of some of the courses taught in the Department of Physics at FHSU.

2 Introductory Classes

2.1 Engineering Physics I

Physics I is an introduction to mechanics and thermodynamics (if time allows). It begins modules on vectors, kinimatics, and Newton's Second Law

$$\vec{F} = m\vec{a}. \tag{1}$$

This if followed by Conservation of Energy and work

$$W = \int_a^b \vec{F} \cdot d\vec{l}, \tag{2}$$

then Circular Motion and some Orbital Dynamics, and finally waves and basic heat transfer if time allows.

2.2 Engineering Physics II

Physics II is an introduction to electricity and magnetism, which includes optics. It begins with the Electric Force and Coulomb's Law,

$$\vec{F}_e = \frac{kq_1q_2}{r^2}\hat{r} \tag{3}$$

then covers the electric field and electric potential. This is followed by an introduction to magnetic fields, the forces they exert on charged particles

$$\vec{F}_B = q\vec{v} \times \vec{B} \tag{4}$$

and thier creation by current (Biot-Savart Law)

$$\vec{B} = \int \frac{\mu_0 i}{4\pi r^2} d\vec{l} \times \hat{r} \tag{5}$$

2.3 Modern Physics

Modern Physics is an introduction to physics developed after 1900. This includes basics concepts of the Special Theory of Relativity, such as time dilation and length contraction

$$\Delta t' = \gamma \Delta t \tag{6}$$

$$\Delta L' = \gamma^{-1} \Delta L \tag{7}$$

$$\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} \tag{8}$$

3 Intermediate Classes

These classes typically list one or more of the classes in Section 2. We only list a few examples here.

3.1 Statics

This is a class devoted to analyzing systems that do not move (i.e. static). The systems are in static equilibirum, meaning

$$\vec{v} = 0, \tag{9}$$

$$\sum_i \vec{F}_i = 0. \tag{10}$$

Statics is important for analyzing the stresses on structures like bridges and other large structures.

3.2 Circuits

This class is devoted to analyzing circuits, which is only briefly covered in Physics II (see Section 2.2). It turns out Kirchhoff's rules are only one way to analyze a circuit.

3.3 Analog and Digital Circuits

This course is devoted to *building* circuits, starting with analog circuits and ending with digital circuits. It includes a lab component.

4 Advanced Classes

4.1 Electricity and Magnetism

There are several advanced physics courses available including Electricity and Magnetism, Mechanics, Optics, Introduction to Thermal Physics, Quantum Mechanics I, and even Mathematics for the Physical Sciences where students get to see Dr. Deyo derive things like Stoke's theorem

$$\iint_S \left(\nabla \vec{F}\right) \cdot d\vec{S} = \oint \vec{F} \cdot d\vec{l}, \tag{11}$$

Gauss's Theorem (Divergence Theorem)

$$\iiint_V \left(\nabla \cdot \vec{F}\right) dV = \oiint \left(\vec{F} \cdot \hat{n}\right) dS \tag{12}$$

and the Residue Theorem of Complex Analysis

$$\oint f(z) dz = 2\pi i \sum \text{Res}\left\{f(z)\right\}. \tag{13}$$

Course Number	Credit Hours
Phys 211	4
Phys 211L	1
Phys 212	4
Phys 212L	1
Phys 221	3
Phys 313	3
Phys 331	3
Phys 332	3
Phys 651	3
Phys 652	1
Phys 672	3
Phys 677	3

Table 1: Credit hours for various physics courses.

5 Credit Hours

Most lecture courses offered in the department are **three** hour courses, but there are a few exceptions. Lab courses are typically **one** hour. See Table 1 for a partial list.