PHYS:1200 LECTURE 1—INTRODUCTION

Lecture 1 presents the motivation for taking this course, discusses some of the specific topics that will be covered, and attempts to explain what physics is, and what is its relation to the other scientific disciplines. The course is designed around the premise that we are already aware of many physics concepts based on what we experience in our everyday lives, and the technological devices we use, such as cell phones, laptops, tablets, etc. These devices are the result of technologies that were developed from basic physics discoveries.

Physics deals with the physical world we live in, and the course tries to show that there are **a few basic principles** that we can discover by thinking a bit more deeply about what is going on around us. Some of the topics that will be discussed in the course are listed in slides 4-7.

Physics is a discipline that deals with ***physical* objects – *matter*,** from the smallest scale size of the atom to the largest scale of the universe. It covers processes on all timescales. The goal of physics is to discover the patterns of behavior of physical objects and to quantify these patterns into a set of "laws" that can be used to predict how processes proceed in time and space. The relation of physics to the other sciences – physical, biological, and social are discussed in slides 10-12.

The methods used to uncover the patterns of behavior of physical objects are presented in slide 13. The most important point that must be emphasized is that **physics is an experimental science** – that is – it is entirely derived from **observations** of nature. We cannot discover the laws of physics by mere logic or reasoning – the laws of physics are simply a codification or summary, usually in mathematical form, of what occurs in nature. Although we refer to these as "laws" it must be understood that they only apply until we discover new phenomena that requires that they be revised, amended, or sometimes completely abandoned. **The "laws" must be continually tested by experiments to find their range of applicability**. For example – the laws of motion which were formulated in the 18th century were revised in the 20th century by Einstein's theory of special relativity.

We will begin to study the laws of motion in Lecture 2. We'll start with the question: Why does an object move?

Finally, a few comments about **what you need to do to get the most out of this course**. The course is divided into 7 topical areas or units, each containing several individual lecture presentations as indicated in the Table below:

UNIT	NUMBER OF LECTURES	LECTURES	TOPIC
0	1	1	Introduction
1	10	2-11	Mechanics
2	4	11-15	Fluids
3	4	16-19	Thermodynamics
4	3	20-22	Vibrations and Waves
5	6	23-28	Electricity and Magnetism
6	4	29-32	Light and Optics
7	4	33-36	Atomic and Nuclear Physics

The lectures will include a PowerPoint presentation and classroom demonstrations. Seeing the lecture demonstrations is very important, because they will enable you to actually observe the phenomena being discussed. Whenever possible, the presentations will focus on phenomena that you are probably aware of, since it is part of "everyday experience." Although the demonstrations are referred to in the PowerPoint slides, **this is no substitute for seeing the demonstrations yourself**. Over the years, many students have commented that the demonstrations are the best part of the course. If you want to get the most out of this course, you really need to come to class.

The lecture presentations (PowerPoint slides) will be posted on the class webpage before each class. The full slide shows and a PDF file with 6 slides per page are posted and can be downloaded. Also, **Lecture Notes** for each lecture are posted. The lecture notes and presentations are essentially the textbook for the course. The lecture notes present the material in a narrative form that is designed to provide more context than is given in the bullet point style of the slide shows. I suggest that you read the lecture notes side by side with the slide show. Both the slide shows and the lecture notes contain numerical examples that illustrate the application of the formulas that will be presented. Physics is a quantitative

subject which cannot be presented entirely in a conceptual manner. Learning how to use simple formulas is an important part of this course.* Typically roughly 1/3 of the questions of the exams are quantitative and require the application of a formula. All of the formulas will be provided with each exam – there is no need to memorize them.** For each lecture an assignment is also given that includes review questions and exercises. After studying the lecture notes and slide shows, you should try to do the assignments for that lecture. The answers and solutions to all the questions are provided, but it is very important that you attempt to do the questions before reading the solutions. Skill at problem solving cannot be acquired passively, it is an active process that requires thought and patience.

The assignments will not be collected and graded which places the burden on you to establish and maintain a suitable study schedule to learn the course material. This is probably quite different from what you experienced in most of the classes that you have taken. *The responsibility for learning and achieving success in this class is entirely in your hands.*

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* For those students who have not had recent experience dealing with basic math, or for those that may need to review this material, a set of notes containing a basic math review is given as an assignment for Lecture 1. This will enable you to brush up on some basic high school algebra and geometry. Also, the basic math review contains notes on the use of **scientific notation.** We often deal with numbers that have very small or very large magnitudes. Scientific notation is just a convenient shorthand notation that removes the need to write out many zeros, for example: $1{,}000{,}000 = 1.0 \times 10^{6}$ and $0.000001 = 1.0 \times 10^{-6}$.

****You will not be allowed to use calculators on the exams**. The numerical problems will always involve numbers that can be calculated with simple arithmetic with no need of calculators.