

## **Syllabus: Natural Science I: How Things Work / CORE-UA-214-001**

Instructor: Prof. Andy Haas, Physics <[andy.haas@nyu.edu](mailto:andy.haas@nyu.edu)>

Lecture Tues and Thurs, 9:30 am - 10:45 am, Meyer Hall, Room 121 (plus your lab section)

Office hours, Thurs 1:00 pm (or by appointment), 726 Broadway - room 858

Do you know how electricity is generated and transported? How instruments create music? Why the sky is blue and why there are rainbows? What makes refrigerator magnets stick? How do computers work? How your computer monitor and plasma screen TV produce their colors and pictures? All of the devices that define contemporary living are applications of basic scientific discoveries. The principles underlying these devices are fascinating as well as useful, and explain as well many of the natural features and phenomena of the world around us. This course familiarizes you with some basic principles of physics through their applications to selected devices such as CD and DVD players, the basic electronic components of computers, lasers and LEDs, why the sky is blue, how rainbows are made, and lenses. In learning the basic physics behind these modern inventions, you will develop a deeper understanding of how the physical world works and gain a new appreciation of everyday phenomena that are ordinarily taken for granted. The course is designed for non-science students with an interest in the natural world. The basic physical ideas needed to understand how things operate are presented using some mathematics, but none beyond elementary high school-level.

### **Required Materials:**

1. A WileyPLUS access code – includes an e-book of *How Things Work: The Physics of Everyday Life*, 5th Edition by Louis A. Bloomfield, John Wiley and Sons.

Purchasing access will be required to do the online homework assignments - get at the campus bookstore, or directly here: [www.wileyplus.com/class/659333](http://www.wileyplus.com/class/659333)

2. *How Things Work Laboratory Manual* - available at the NYU Bookstore.

### **Assessments:**

Examination 1: 20%

Examination 2: 20%

Final examination: 30%

Laboratory: 20%

WileyPlus Online Homework: 10%

Examinations will be in multiple-choice format. A calculator is allowed (not a phone!).

*Important: Excused absences from the exams without prior notice will be given only in the case of sudden illness (and will then require a doctor's note). If you know in advance that you will not be here on an exam date for the observance of a religious holiday, you must notify your instructor in advance, in writing, at least two weeks before the exam date. A different exam date will then be arranged for you. All other absences will be considered unexcused and will result in a grade of zero for that exam.*

## Laboratory:

These weekly sessions are an important part of the course. You must be registered for one lab section. You will have to submit a lab report for each experiment performed. The lab report has to include answers to all questions and any data you may have collected. The lab report will be due in lab one week after the experiment has been performed.

*The lab instructor will deduct points from your lab grade for arriving late or leaving early.*

As with the exams, excused absences will only be given in the case of illness (with a doctor's note) or observation of a religious holiday. You must notify your lab instructor in advance in writing if you miss a lab due to religious reasons. All other absences will be considered unexcused and will result in a lab grade of zero. You cannot make up a lab by attending a laboratory session that you are not registered for.

Late lab reports will be penalized for each day late (excluding weekends).

Each lab instructor will hold a weekly office hour where you can discuss lecture and laboratory material. Office locations and office hour schedule will be announced in lab.

Please read the lab manual and think about it *before* coming to lab. *A quiz is often given at the beginning of the lab session.*

## Homework:

Homework is done online using WileyPlus.

It is assigned online towards the end of each week and due by the following week.

Late assignments will be penalized 50%, reducing the maximum score to 50%.

## Lectures, Readings, Labs, and Exam Dates:

Please read the relevant subchapter of the book (listed after the date) before each lecture!

<u>Date</u>	<u>Book section</u>	<u>Topic</u>
Tues. Sep. 4	1.1	Skating - motion, velocity
Thurs. Sep. 6	1.2	Falling balls - gravity, acceleration
<i>Week of Sep. 10</i>		<i>Lab 1: Math review</i>
Tues. Sep. 11	1.3, 2.2	Wheels - friction
Thurs. Sep. 13		No class!
<i>Week of Sep. 17</i>		<i>Lab 2: Kinematics</i>
Tues. Sep. 18	2.3	Bumper cars - momentum
Thurs. Sep. 20	9.1	Clocks - periodic motion
<i>Week of Sep. 24</i>		<i>Lab 3: Speed of sound</i>
Tues. Sep. 25	9.2	String instruments
Thurs. Sep. 27	9.2, 9.3	Wind instruments and wave superposition
<i>Week of Oct. 1</i>		<i>Lab 4: Ohm's law</i>
Tues. Oct. 2	10.1	Static electricity - charge, Coulomb's law
Thurs. Oct. 4	10.2	Electric fields - voltage, capacitors
<i>Week of Oct. 8</i>		<i>No lab!</i>
Tues. Oct. 9		No class!
Thurs. Oct. 11		<b>Exam 1 --- covers chapters 1, 2, and 9</b>

<i>Week of Oct. 15</i>		<i>Lab 5: Capacitors</i>
Tues. Oct. 16	10.3	Flashlights - power and Ohm's law
Thurs. Oct. 18	11.1	Magnets
<i>Week of Oct. 22</i>		<i>Lab 6: Magnetism</i>
Tues. Oct. 23	11.2	AC Power
Thurs. Oct. 25	13.1	Sunlight - the blue sky and rainbows
<i>Week of Oct. 29</i>		<i>Lab 7: Spectroscopic analysis of light</i>
Tues. Oct. 30	13.2	Discharge lamps - light spectra
Thurs. Nov. 1	13.3	LEDs
<i>Week of Nov. 5</i>		<i>Lab 8: Young's experiment and interference of light</i>
Tues. Nov. 6	13.3	LASERS
Thurs. Nov. 8	14.2,14.3	Digital recording, communication, and audio players
<i>Week of Nov. 12</i>		<i>Lab 9: Reflection, refraction, and dispersion</i>
Tues. Nov. 13		<b>Exam 2 --- covers chapters 10, 11, and 13</b>
Thurs. Nov. 15	12.1	Radio waves
<i>Week of Nov. 19</i>		<i>No lab!</i>
Tues. Nov. 20	12.2	Microwave ovens
Thurs. Nov. 22		No class!
<i>Week of Nov. 26</i>		<i>Lab 10: Geometrical optics</i>
Tues. Nov. 27	14.1	Cameras - lenses
Thurs. Nov. 29	14.1	Cameras - focal length
<i>Week of Dec. 3</i>		<i>Lab 11: Photoelectric effect and quantum light</i>
Tues. Dec. 4	15.3	X-rays
Thurs. Dec. 6	15.3	Radiation
<i>Week of Dec. 10</i>		<i>No lab (canceled due to safety concerns)!</i>
Tues. Dec. 11	15.1	Nuclear weapons
Thurs. Dec. 13	15.2	Nuclear reactors
Finals week		<b>Final Exam --- covers everything, but weighted towards topics after exam 2</b>