

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

Instructor: Prof. Andy Haas, Physics <andy.haas@nyu.edu>

Lecture M/W, 12:30-1:45pm, Meyer Hall, Room 121 (plus your lab section)

Office hours, W 5:00pm, Meyer 706

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 (for hard copy), or direct (online) from: www.wileyplus.com/class/474606

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 simple calculator is allowed.

Excused absences from the exams without prior notice will be given only in the case of sudden illness (and require a doctor's note). If you know you will not be here on an exam date for a religious holiday, you must notify your instructor at least two weeks before the exam date.

Laboratory:

You must be registered for a lab section. You will have to submit a lab report for each experiment performed each week. *The report will be due in lab one week after the experiment has been performed.* The lab sessions will be held in Meyer 161 and will begin the week of Sept. 7th. *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 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. Please read the lab manual and think about it *before* coming to lab. A short 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%.*

Readings, Lectures, Labs, and Exam Dates:

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

9/2 - Introduction, 1.1 Skating - motion, velocity, 1.2 Falling balls - gravity, acceleration (Wed)

Week of 9/7 - Lab 1: Math review

No class (Mon) : 1.3 (part) - Energy, 2.2 Wheels - friction (Wed)

Week of 9/14 - Lab 2: Kinematics

2.3 Bumper cars - momentum (Mon) : 9.1 Clocks - periodic motion (Wed)

Week of 9/21 - Lab 3: Speed of sound

9.2 String instruments (Mon) : **No Class (Wed)**

Week of 9/28 - No lab

9.2 Wind instruments, 9.3 (part) Waves (Mon) : 10.1 Static electricity, charge (Wed)

Week of 10/5 - Lab 4: Ohm's law

10.2 Electric fields, voltage, Exam1 Review (Mon) : *Exam 1, covers sections 1, 2, and 9 (Wed)*

Week of 10/12 - Lab 5: Capacitors

10.3 Flashlights - Circuits, power, and Ohm's law (Tuesday) : 11.1 Magnets (Wed)

Week of 10/19 - Lab 6: Magnetism

11.2 AC Power (Mon) : 13.1 Sunlight - the blue sky and rainbows (Wed)

Week of 10/26 - Lab 7: Spectroscopic analysis of light

13.2 Discharge lamps - light spectra (Mon) : 13.3 LEDs (Wed)

Week of 11/2 - Lab 8: Young's experiment and interference of light

13.3 LASERs (Mon) : 14.2,14.3 Digital recording and communication, Review (Wed)

Week of 11/9 - Lab 9: Reflection, refraction, and dispersion

Exam 2, covers sections 10, 11, and 13 (Mon) : 12.1 Radio waves (Wed)

Week of 11/16 - Lab 10: Geometrical optics

12.2 Microwave ovens (Mon) : 14.1 Cameras - lenses (Wed)

Week of 11/23 - No lab

14.1 Cameras - focal length (Mon) : No class (Wed)

Week of 11/30 - Lab 11: Photoelectric effect and quantum light

15.3 X-rays (Mon) : 15.3 Radiation (Wed)

Week of 12/7 - No lab (nuclear weapons lab canceled due to safety concerns)

15.1 Nuclear weapons (Mon) : 15.2 Nuclear reactors (Wed)

12/14 - Review (Mon)

Finals week - Final Exam --- covers everything (but weighted towards topics after exam 2)