

Physics – prepared by Dr. Antonio Martínez, UPR-Río Piedras

This webpage consists of a listing of websites in the worldwide web that faculty may use to enhance the teaching of undergraduate courses in Physics. Along with the address for each website, a brief description of the content of the site is provided. The websites reviewed, include various resources such as exercises and tests, summaries of material, animations and virtual experiments. They have been classified according to the course in which they can be used:

- General/University Physics
- Intermediate Mechanics
- Electromagnetism
- Modern Physics and Quantum Mechanics
- Thermodynamics and Statistical Mechanics
- Astronomy

In addition to topics for the above course categories, Physics references and topics on everyday Physics are included.

General/University Physics

<http://www.physics.uoguelph.ca/tutorials>

Language: English

Some introductory mechanics and electromagnetism material presented in the form of tutorials. It includes a remedial section where fundamental math concepts are reviewed. It also has short tests to verify the degree of mastery of the material. A good place to start.

<http://www.glenbrook.k12.il.us/gbssci/phys/Class/BBoard.html>

Language: English

A site meant to be a resource for high school Physics students, yet definitely useful for college/university physics students. Good text and animations explaining basic Physics concepts. It covers the areas of Mechanics, Electromagnetism and special relativity at an introductory level. A good resource to help build a good foundation even for college/university physics students.

<http://webphysics.davidson.edu/Applets/Applets.html>

Language: English

Physlets (**Physics Applets**) Website. This site provides guidance for the instructors that want to learn how to use these Java applets designed for science education. It contains tutorials, download instructions, and example problems to help you use Physlets in your teaching. Requires some work, but looks worth the effort.

<http://physics.webplasma.com/physicstoc.html>

Language: English

Mechanics at the university Physics level. Physics For Beginners. Self-described as an introduction to physics for the absolute beginner. Good resource for the instructor. Good ideas to introduce concepts. No animation, but solid in content.

<http://library.thinkquest.org/10796/>

Language: English

An online introductory physics textbook. Very well done with animated illustrations and problems that are graded on line. Covers Mechanics, Light and Electromagnetism. Very good.

http://theory.uwinnipeg.ca/mod_tech/index.html

Introductory physics textbooks. Plain but clear illustrations. Good questions at the end of each section. Covers topics on mechanics, electromagnetism, thermodynamics, waves and modern physics.

http://www.phys.virginia.edu/classes/109N/more_stuff/Applets/ProjectileMotion/jarapplet.html

An isolated applet on projectile motion. Allows for playing with initial conditions.

<http://230nsc1.phy-astr.gsu.edu/hbase/hph.html>

Language: English

A complete university physics course in “flashcard” form, including modern physics. It may be a good resource for students as a study guide or for exam preparation.

<http://www.upscale.utoronto.ca/GeneralInterest/Key/genPHY100.html#THE%20COURSE%20CONTENT>

Language: English

Site for a course with a goal to provide an overview of some of the most important, and basic contributions which Physics has made to human knowledge in an entertaining way.

<http://www.sciencejoywagon.com/physicszone/lesson/default.htm>

Language: English

Neat site introducing physics concepts with a bit of humor. Special attention is given to debunking misconceptions. Good animations and entertaining text. Covers mechanics, electromagnetism and modern physics.

<http://www.mip.berkeley.edu/physics/>

Language: English

UC Berkeley Physics Lecture Demonstrations. Wow! A wealth of demonstrations to bring to the physics classroom. Relatively simple setup and very effective in conveying the principle involved. Excellent.

<http://www.plus2physics.com/>

Language: English

An physics primer covering all major subjects of an university physics course. Good text explanations with good illustrations. Includes a tests.

http://galileoandstein.physics.virginia.edu/more_stuff/Applets/home.html

Language: English

A neat selection of applets illustrating several concepts; from mechanics to thermodynamics. Very good.

<http://www.phy.ntnu.edu.tw/java/index.html>

Language: English & Spanish

Virtual Physics Laboratory. Many animations illustrating introductory physics topics. Mechanics, electromagnetism, waves, and thermodynamics. Very good.

<http://personal.iddeo.es/romeroa/>

Language: Spanish

Introductory physics material to supplement classroom experience. Some animations and provides historical background on some of the topics covered.

Mechanics

<http://www.sc.ehu.es/sbweb/fisica/celeste/celeste.htm>

Language: Spanish

Excellent site with good text explanations and animations that can be manipulated to illustrate the celestial dynamics. Central field problem, Kepler's laws, tides among others, all very well treated. Intermediate mechanics level.

<http://www.learner.org/exhibits/parkphysics/>

This website allows you to build your own roller coaster and other amusement park rides while emphasizing the fundamental mechanics behind the design. After you have built you can go for a virtual ride. Good for both university physics and intermediate mechanics students.

<http://electron6.phys.utk.edu/phys594/Tools/mechanics/summary/mechanics.htm>

Language: English

A wealth of formulas and other tools of intermediate mechanics. Good to help summarize material.

<http://www.sc.ehu.es/sbweb/fisica/cinematica/cinematica.htm>

Language: Spanish

Excellent site with good text explanations and animations that can be manipulated to illustrate the concept of kinematics in one and two dimensions including circular motion. University physics level.

http://www.phys.virginia.edu/classes/109N/more_stuff/Applets/Collision/jarapplet.html

Language: English

Excellent applet on two dimensional motion. Shows the motion in the lab and center of mass reference frames. Very good resource.

http://arxiv.org/PS_cache/physics/pdf/9906/9906066.pdf

Language: Spanish

A graduate mechanics course notes. Only text. Clearly written and well conceived.

<http://www.sc.ehu.es/sbweb/fisica/dinamica/dinamica.htm>

Language: Spanish

Excellent site with good text explanations and animations that can be manipulated to illustrate the concept of dynamics. Excellent animations and text. University physics level.

<http://www.mcasco.com/p1outln.html>

Language: English

Excellent online introductory course on Mechanics at the university physics level. Very well done with links to a physics dictionary in the text and great graph generating applets.

<http://electron6.phys.utk.edu/phys594/archives/marchives.htm>

Language: English

A database of intermediate mechanics problems with detailed solutions and illustrations. Excellent resource for both students and instructors.

<http://www.sc.ehu.es/sbweb/fisica/solido/solido.htm>

Language: Spanish

Excellent site with good text explanations and animations that can be manipulated to illustrate the concept of oscillations. Includes a treatment of the approximation of potentials with minima as simple harmonic oscillators. Excellent animations and text. University physics/Intermediate mechanics level.

Electromagnetism/Optics

<http://micro.magnet.fsu.edu/electromag/java/index.html>

A section of the Molecular Expressions website dedicated to all types of microscopy. A multimedia educational website covering the area of electromagnetism at the University Physics/Intermediate level. It incorporates interactive computer based instruction, text, manipulatives and classroom and individualized activities. Animated tutorials are excellent as they provide for exploration through manipulation. Very good !

<http://www.cco.caltech.edu/~phys1/java.html>

Neat applets demonstrating several electromagnetism concepts. Some incorporate relativistic effects. Applets displaying like electric field and equipotential lines for user constructed charge distributions, LCR circuits, inductance, special relativity effects and radiation patterns for a moving charge. Excellent.

<http://physics.syr.edu/courses/vrml/electromagnetism/>

Language: English

Very extensive library of VRML animations on electromagnetism. Illustrates important concepts from basic vector operations to Faraday's and Ampere's Laws. Very Good.

<http://www.sc.ehu.es/sbweb/fisica/elecsmagnet/elecsmagnet.htm>

Language: Spanish

Good and helpful treatment of electromagnetism concepts from definition of electric field to dielectrics. Supported with well conceived illustrations and applets that allow user manipulation to illustrate effects of variables. Very good.

<http://physics.syr.edu/courses/vrml/electromagnetism/>

Contains five applets and brief explanations of electromagnetic waves and fields. Website supports an electrical engineering electromagnetism class. Most of the animations would be useful also in a university physics level course.

<http://micro.magnet.fsu.edu/optics/tutorials/index.html>

Language: English

A section of the Molecular Expressions website dedicated to all types of microscopy. A multimedia educational website covering the area of optics. It incorporates interactive computer based instruction, text, manipulatives and classroom and individualized activities. Animated tutorials are excellent as they provide for exploration through manipulation. Very good !

<http://www.phys.ksu.edu/perg/vqm/laserweb/>

Language: English

Treatment of the fundamentals of optics leading to an explanation of functioning and nature of the laser. Includes applets that allow for student manipulation and exploration.

<http://www.enzim.hu/~szia/cddemo/edemo0.htm>

Language: English

An animated tutorial explaining electromagnetic waves and circular dichroism. Very helpful to explain polarization phenomena and the interaction of light with matter.

Astronomy

<http://itss.raytheon.com/cafe/cafe.html>

Language: English

Excellent site with sections as: “Ask the Astronomer ” where visitors questions are answered and archived, “A Career Guide” where the nature of research in the field is highlighted with the aim of helping the student learn about a profession in Astronomy. Images and movies related to space science and astronomy.

<http://hubble.stsci.edu/>

Language: English

The site for the Hubble Space Telescope. A gallery of impressive images taken with the HST. Information about the telescope and ongoing projects. Some educational games. Excellent.

<http://www.heavens-above.com/>

Language: English

Neat site. Instructions (date, time and detailed star charts) to observe the path of satellites in the sky from any location (including San Juan, PR) You can observe the International Space Station (ISS) and the Hubble Space Telescope (HST) as they fly over your location.

<http://antwarp.gsfc.nasa.gov/apod/astropix.html>

Language: English

Website for the Goddard Space Flight Center in Maryland. Publishes a daily astronomical image with an excellent explanation. The astronomical terms used in the text are “linked” to a dictionary.

<http://www.universetoday.com/>

Language: English

Online periodical on astronomical news. Links are provided to the original source of the newspiece.

Modern Physics/Quantum Mechanics

<http://www.colorado.edu/physics/2000/index.pl>

Language: English

Wow! This site offers excellent expositions of Modern Physics concepts and phenomena. It covers fundamental and applied aspects. Many animations illustrating physical concepts: from electromagnetic theory to quantum mechanics, this site covers a lot of the material taught in a typical Modern Physics course. It is divided in four sections: What is it?, Einstein’s Legacy, The Atomic Lab and Science Trek. Excellent.

www.nobel.se

Language: English

Website for the Nobel Foundation. Includes articles about the recipients of the famous award, including Physics. It contains also games to illustrate the concepts associated with the awards. Very good.

<http://www.sc.ehu.es/sbweb/fisica/cuantica/FisicaModerna.htm>

Language: Spanish

Excellent text, illustrations and animations of important concepts in quantum mechanics. Very useful applets covering extensive material including historically important experiments in the development of quantum mechanics, wave mechanics and scattering, among others.

http://itl.chem.ufl.edu/4412_aa/pwdual.html

Language: English

A “word” (no equations) introduction to quantum mechanics with a historical perspective. A lot of text with illustrations.

<http://www2.slac.stanford.edu/vvc/Default.htm>

Language: English

Stanford Linear Accelerator Center virtual visitor center. Tutorials on quantum theory, particle physics and other modern physics topics related to the work being carried out in SLAC. Very good.

<http://physics.hallym.ac.kr/education/qm/vqm/vqm.html>

Language: English

A modern physics on line course with links in the text to illustrations and definitions.

<http://library.thinkquest.org/C005775/sitemap.html?tqskip1=1&tqtime=0407>

Language: English

Entertaining and educational introduction to the concepts of quantum mechanics. Illustrates concepts with the aid of cartoons. Fun way to introduce material.

http://atschool.eduweb.co.uk/rmext04/92andwed/pf_quant.html#Top

Language: English

Particles, Special Relativity and Quantum Mechanics. Very good site discussing contemporary physics fundamental problems and their importance. Very useful to help the seasoned student explore the implications of the material covered in class.

<http://www.phys.ksu.edu/perg/vqm/>

Language: English

Extensive site dedicated to developing visual instructional materials about quantum physics. The user downloads software that allows for manipulation and exploration. Excellent resource to complement and reinforce the material presented in class.

<http://particleadventure.org/particleadventure/>

Language: English & Spanish

The Particle Adventure. An interactive tour of particle physics prepared by the Lawrence Berkeley National Laboratory Particle Data Group. Excellent.

<http://www-ed.fnal.gov/>

Language: English

The website for the Education Office of FermiLab. Extensive and interesting coverage of particle physics. Activities for students using actual FermiLab experiment data.

<http://www.aip.org/history/esva/>

Language: English

A collection of some 25,000 historical photographs, slides, lithographs, engravings, and other visual materials by the American Institute of Physics. The collection focuses on American physicists and astronomers of the twentieth century. Great resource to bring a historical outlook to the classroom.

Thermodynamics/Statistical Mechanics

<http://www.sc.ehu.es/sbweb/fisica/estadistica/estadistica.htm>

Language: Spanish

Excellent combination of lecture notes and animations on thermodynamics and statistical mechanics at the intermediate level. Includes an interesting consideration and animation of the thermodynamics of the detonation of nuclear device.

<http://electron4.phys.utk.edu/141/nov14/November%2014.html>

Language: English

Good class notes from a basic thermodynamics course. Clear text with illustrations. No animation.

<http://www.taftan.com/thermodynamics/>

Language: English

Course notes on basic thermodynamics with a good section on applications. Very well done and clearly explained. It has links to other sites to further illustrate covered topics. Very good.

<http://www.chem.unsw.edu.au/staff/hibbert/perpetual/default.html>

Language: English

Site on perpetual motion with archival cases of proposed perpetual motion machines. Excellent resource.

<http://www.secondlaw.com/>

Language: English

A whole site devoted to the second law of thermodynamics! Excellent in content, good ideas for class preparation on this subject.

<http://www.math.psu.edu/gunesch/entropy.html>

Language: English

Links to various websites devoted to the topic of entropy in several disciplines. Of particular interest: the physical sciences link. Excellent.

<http://www.plmsc.psu.edu/~www/matsc597c-1997/>

Language: English

Class notes on an advanced statistical thermodynamics course. Good explanations.

<http://www.bluneptune.com/~xmwang/physDemo.html#thermo>

Language: English

Excellent treatment of the Carnot, Otto and Diesel cycles with excellent animations. Good text. Highly recommended

Gadget Physics

<http://www.howstuffworks.com>

Language: English

Hundreds of articles for different disciplines explaining the operation of artifacts and natural phenomena. Rich in media presentations to illustrate concepts.

<http://rabi.phys.virginia.edu/HTW/>

Language: English

Hundreds of articles to explain the operation of artifacts and natural phenomena that we experienced in our daily life. Excellent material but it is mostly in text format.

Physics References

<http://physics.nist.gov/cuu/Constants/index.html>

Language: English

National Institute of Standards and Technology site with the values of physical constants. Good reference for students.

<http://physics.about.com/>

Language: English

Multifield Physics site with articles/sections on many physics subjects. Many links to other websites organized by subject: from Acoustics to Weather Physics. Includes a Physics dictionary which can be of help to students. The level of the material ranges from very introductory (freshman level) to quite sophisticated (senior Physics major level).

<http://www.aip.org/physnews/update/>

Language: English

Physics news posted weekly, with archival resources back to 1990.

<http://www.th.physik.uni-frankfurt.de/~jr/portraits.html>

Illustrations and photographs of famous physicists from pre-21 st century to the present, including recent Physics Nobel laureates.