Integrating PhET with Undergraduate Physics

http://phet.colorado.edu

Introductory Physics Activities

Mechanics

Unit 1: **Introduction to Motion**
- Activity: Moving Man
- Game: Estimation

Unit 2: **More on motion**
- Activity: Vector Addition
- Activity: Projectile Motion

Unit 3: **Forces and the Laws of Motion**
- Activities: Forces in 1 Dimension
  - 1 Predicting speed and directions changes
  - 2 Relating graphs and free body diagrams
- Activities: The Ramp
  - 1 Using Free Body Diagrams
  - 2 Quantitative Activity
- Activity: Maze Game
  - 1 Using Vector Representations to Move through a Maze
- Activity: Curve Fitting: How well does the curve describe the data?
- Demo: Friction

Unit 4: **Work, Energy, Momentum and Collisions**
- Activities: Masses & Springs:
  - 1 Homework activity
  - 2 Conservation of Energy
- Activities: Energy Skate Park
  - 1 Intro to Conservation of Mechanical Energy *
  - 2 Relating Graphs, Position and Speed (no time graphs)*
  - 3 Calculating Speed and Height (no time graphs) *
  - 4 Calculations with Conservation of Mechanical Energy Using Time Graphs

Unit 5: **Circular Motion**
- Activity: Ladybug Revolution
- Activity: Maze Game
  - 2 Vector Controls for Circular Motion

Electricity & Magnetism

Unit 1: **Heat and Thermodynamics**
- Demo: Friction
- Activity: Microwaves and Gas Properties for understanding KMT
- Activity: States of Matter
- Activity: The Greenhouse Effect

Unit 2: **Waves: Introduction to light and sound**
- Activity: Waves on a String
- Activity: Sound
- Activities: Fourier: Making Waves
  - 1 Wave Representation
  - 2 Superposition of Waves
- Activity: Geometric Optics
- Games: Fourier has a game tab

Unit 3: **Electric and Magnetic Forces and Fields**
- Activity: Introduction to Electric Fields: uses both Electric Field Hockey Charges and Fields
- Activity: Faraday's Electromagnet Lab
  - 1 Introduction to Magnets
- Games: Electric Field Hockey
- Demo: Balloons & Static Electricity and John Travoltage

Unit 4: **Current, Resistance, Circuits, and Circuit Elements**
- Demo: Introduction to Electric Fields: Charges and Fields
- Activity: Circuit Construction CCK and equipment set:
  - 1 Some Properties of electric circuits using equipment and CCK
  - 2 Series and Parallel Circuits using equipment and CCK
  - 3 Combo Circuits using equipment and CCK

Unit 5: **Induction, Alternating Current, Modern Electronics**
- Activity: Faraday's Electromagnet Lab
  - 2 Induction
- Demos: Conductivity, Semiconductors, Photoelectric effect

* Scroll to *Teaching Ideas* section of individual simulation page to find activities designed specifically for that simulation. Or browse all the activities here: http://phet.colorado.edu/teacher_ideas/browse.php

Sample Use of PhET Simulations

http://phet.colorado.edu

Physics of Everyday Life: 1st Semester

1. Motion
   - **Moving Man**
   - **Maze Game**
   - **Force 1D**
   - **Lunar Lander**
   - **Projectile Motion**
2. Spring Scales
   - **Masses and Springs**
3. Work and Energy
   - **Energy Skate Park**
   - **Friction**
   - **The Ramp**
4. Water Distribution
5. Sound: Speakers and Violins
   - **Gas Properties**
   - **Sound**
   - **Wave on a string**
6. Lightbulbs, the Sun, and EM Radiation
   - **Blackbody Spectrum**
7. Greenhouse Effect
   - **Greenhouse**
8. Static Electricity
   - **Balloons and Static Electricity**
   - **Electric Field Hockey**
   - **Charges and Fields**
   - **John Travoltage**
9. Flashlights, circuits, batteries, and power
   - **Signal Circuit**
   - **Circuit Construction Kit**
   - **Battery Voltage**
   - **Battery-Resistor Circuit**
   - **Ohm's Law**
10. EM Wave Generation and Radio waves
    - **Radio Waves and Electromagnetic Fields**
11. Microwaves
    - **Microwaves**
12. Discharge Lamps and Fluorescent Lights
    - **Discharge Lamps**

Physics of Everyday Life: 2nd Semester

13. Photocopiers and semiconductors
    - **Conductivity**
    - **Semiconductors**
14. Transformers and Power Distribution
    - **Circuit Construction Kit**
    - **Faraday's Lab**
15. Sound, Speakers, and Amplifiers
    - **Gas Properties**
    - **Sound**
    - **Faraday's Lab**
    - **Semiconductors**
16. Light Emitting Diodes
    - **Semiconductors**
17. TV and light/color
    - **Discharge lamps**
    - **Blackbody Spectrum**
    - **Color vision**
18. Sunlight & Vision
    - **Color vision**
    - **Blackbody Spectrum**
19. Lasers
    - **Lasers**
20. Cameras
    - **Geometric Optics**
21. Hot air balloons and buoyancy
    - **Gas Properties**
    - **Balloons and Buoyancy**
22. Nuclear Weapons and Power
    - **Nuclear Physics**
23. Medical Imaging (Ultrasound and MRI)
    - **MRI**
24. Cosmology

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Modern Physics for Engineers

1. Review of EM Waves
   Radio Waves and Electromagnetic Fields
2. Photoelectric Effect:
   Photoelectric Effect
3. Probability and Randomness and Wave particle duality
   Quantum Wave Interference
4. Rutherford Scattering
   Rutherford Scattering
5. Atomic Spectra and Discharge Lamps
   Discharge Lamps
6. Lasers
   Lasers
7. Balmer Series
8. Bohr and deBroglie Models of the atom
   The Hydrogen Atom
9. Double slit and Davisson Germer experiment
   Quantum Wave Interference, **Davisson Germer: Electron Diffraction**
10. Wave functions and probability
11. Wave packets and uncertainty principle
    Quantum Wave Interference, **Quantum Tunneling**, **Fourier: Making Waves**
12. Wave equations and Differential equations
13. Schrodinger equation for free particle
    Quantum Tunneling
14. Potential Energy
15. Infinite and Finite Square Wells
    Quantum Bound States
16. Quantum Tunneling, Alpha decay and other applications of Tunneling
    Quantum Tunneling
17. Reflection and Transmission
    Quantum Tunneling
18. Superposition, measurement, and expectation values
    Quantum Bound States
19. Hydrogen atom
    The Hydrogen Atom, Rutherford Scattering
20. Multielectron atoms
21. Molecular bonding and solids
    Quantum Bound States/Double Wells and Covalent Bonds/Band Structure
22. Conductivity
    Conductivity
23. Diodes and LEDs
    Semiconductors
24. CCDs
25. Lasers Cooling and BEC
    Physics 2000 (http://www.colorado.edu/physics/2000/)
26. Spin and MRI
    Stern Gerlach Experiment, Simplified MRI
27. EPR paradox

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