

## Semester 1

### Unit 1: Introduction to Motion:

Moving Man IC/CQ  
Calculus Grapher HW/CQ

### Unit 2: More on motion and Measurement

Vector Addition IC/CQ  
Projectile motion IC/CQ

### Unit 3: Forces and the Laws of Motion Publishing skills: curve fit, drawing, tables

Forces and Motion: Two activities IC/CQ  
Ramp- Force and Motion: Two activities IC/CQ  
Maze Game: HW/CQ  
Curve Fitting: HW

### Unit 4: Work, Energy, Momentum and Collisions

Energy Skate Park: Four activities IC/CQ  
Masses and Springs: IC/CQ  
Collision: HW

### Unit 5: Circular Motion and Semester Project

Pendulum: HW/CQ  
Gravity Force Lab: IC/CQ  
Pendulum: HW  
Ladybug 2D: HW/CQ  
Ladybug Revolution: HW/CQ  
Masses and Springs: HW  
Balancing Act: (simulation & activity coming soon)

## Semester 2

### Unit 1: Heat and Thermodynamics

Friction: Demo  
States of matter: IC/CQ

### Unit 2: Waves: Introduction to light and sound

Waves on a String: IC/CQ  
Fourier-Making Waves: Three activities IC/CQ/HW  
Sound: IC/CQ  
Wave Interference: IC/CQ  
Resonance: IC/CQ  
Bending Light: IC  
Geometric optics: IC/CQ

### Unit 3: Electric and Magnetic Forces and Fields

Faraday's Electromagnet Lab: IC/CQ  
Electric Field Hockey with Charges and Fields: IC/CQ  
Balloons and Static Electricity with John Travoltage: Demo / CQ  
Gravity and Orbits: CQ

### Unit 4: Fluid Mechanics, Semester Projects

Density: IC  
Buoyancy: IC  
Balloons and Buoyancy: IC/CQ  
Under Pressure: IC/HW/CQ  
Estimation: HW

### Unit 5: Current, Resistance, Circuits, and Circuit Elements

Charges and Fields: Demo  
Capacitor Lab: HW  
Circuit Construction Kit: Three activities IC/CQ

## Physics of Everyday Life: 1<sup>st</sup> 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: 2<sup>nd</sup> 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

## 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