# Topics list for PHYS 1405, based on Hewitt

**Required topics in red**

Suggested topic are in *italics*; instructors should cover the majority of these topics, depending on their focus for the course

**1.** About Science
- 1.1 Scientific Measurements
- **1.2 Scientific Methods**
- 1.3 Science, Art, and Religion
- 1.4 Science and Technology
- **1.5 Physics – The Basic Science**
- 1.6 In Perspective

**I. MECHANICS**

**2.** Newton's First Law of Motion: Inertia
- *2.1 Aristotle on Motion*
- *2.2 Galileo's Experiments*
- **2.3 Newton's First Law of Motion**
- **2.4 Net Force and Vectors**
- **2.5 The Equilibrium Rule**
- *2.6 Support Fore*
- **2.7 Equilibrium of Moving Things**
- 2.8 The Moving Earth

**3.** Linear Motion
- 3.1 Motion is Relative
- **3.2 Speed**
- **3.3 Velocity**
- **3.4 Acceleration**
- **3.5 Free Fall**
- 3.6 Velocity Vectors

**4.** Newton's Second Law of Motion
- **4.1 Force Causes Acceleration**
- **4.2 Friction**
- **4.3 Mass and Weight**
- **4.4 Newton's Second Law of Motion**
- **4.5 When Acceleration is g – Free Fall**
- *4.6 When Acceleration is less than g – Nonfree Fall*

**5.** Newton's Third Law of Motion
- 5.1 **Forces and Interactions**
- 5.2 **Newton's Third Law of Motion**

*10.3 Circular Satellite Orbits*
*10.4 Elliptical Orbits*
10.5 Kepler's Laws of Planetary Motion
10.6 Energy Conservation and Satellite Motion
*10.7 Escape Speed*

## II. PROPERTIES OF MATTER

**11.** The Atomic Nature of Matter
11.1 **The Atomic Hypothesis**
11.2 **Characteristics of Atoms**
11.3 Atomic Imagery
11.4 **Atomic Structure**
11.5 **The Periodic Table of the Elements**
*11.6 Isotopes*
*11.7 Compounds and Mixtures*
*11.8 Molecules*
*11.9 Antimatter*

**12.** Solids
12.1 Crystal Structure
12.2 **Density**
*12.3 Elasticity*
*12.4 Tension and Compression*
*12.5 Arches*
12.6 Scaling

**13.** Liquids
**13.1 Pressure**
**13.2 Pressure in a Liquid**
**13.3 Buoyancy**
**13.4 Archimedes' Principle**
**13.5 What Makes an Object Sink or Float?**
**13.6 Flotation**
*13.7 Pascal's Principle*
13.8 Surface Tension
13.9 Capillarity

**14.** Gases
14.1 The Atmosphere
**14.2 Atmospheric Pressure**
14.3 Boyle's Law
**14.4 Buoyancy of Air**
**14.5 Bernoulli's Principle**
14.6 Plasma

## III. HEAT

**15.** Temperature, Heat, and Expansion
- **15.1 Temperature**
- **15.2 Heat**
- 15.3 **Specific Heat Capacity**
- **15.4 The High Specific Heat Capacity of Water**
- **15.5 Thermal Expansion**

**16.** Heat Transfer
- 16.1 **Conduction**
- 16.2 **Convection**
- 16.3 **Radiation**
- 16.4 Newton's Law of Cooling
- 16.5 **The Greenhouse Effect**
- 16.6 **Climate Change**
- *16.7 Solar Power*
- 16.8 Controlling Heat Transfer

**17.** Change of Phase
- 17.1 **Phases of Matter**
- 17.2 **Evaporation**
- 17.3 **Condensation**
- 17.4 **Boiling**
- 17.5 **Melting and Freezing**
- 17.6 **Energy and Changes of Phase**

**18.** Thermodynamics
- *18.1 Thermodynamics*
- *18.2 Absolute Zero*
- *18.3 First Law of Thermodynamics*
- 18.4 Adiabatic Processes
- 18.5 Meteorology and the First Law
- *18.6 Second Law of Thermodynamics*
- *18.7 Energy Tends to Disperse*
- *18.8 Entropy*

## IV. SOUND

**19.** Vibration and Waves
- 19.1 **Good Vibrations**
- 19.2 **Wave Description**
- 19.3 **Wave Motion**
- 19.4 **Wave Speed**
- 19.5 **Wave Interference**
- 19.6 **Doppler Effect**