

PHYS1201Q-869L  
Mr. Swift  
Wilby High School  
Full Year 2016-17



**This course is given in cooperation with UConn Early College Experience  
[www.ece.uconn.edu](http://www.ece.uconn.edu)**

### UConn Course Description

Basic facts and principles of physics. The laboratory offers fundamental training in precise measurements.

### Course Goals/Learning Objectives

This course focuses on the big ideas typically included in the first semester of a college level, algebra-based introductory physics class. Students will gain foundational understanding of topics including kinematics, projectile motion, Newton's laws of motion, circular motion, the concepts of work and energy, impulse and momentum, rotational motion, angular momentum, simple harmonic motion, fluid mechanics, basic thermodynamics, waves, reflection and refraction.

### Textbook

Cutnell and Johnson, Physics 8<sup>th</sup> edition, John Wiley & Sons, Inc

### Course Policies

- Students are expected to attend all classes and all credit will be withheld (including UConn credit) for excessive absences per Waterbury Board of Education Policy
- All work should be completed on time. Late work may not be accepted excepting in the event of student absence. Students who are absent when work is due must submit assignments upon return to school.
- All Board of Education Policies apply concerning academic misconduct of any kind and can additionally include withholding of UConn credit for cases of cheating or plagiarism.

### Course Grading

Waterbury Board of Education policies toward grading apply for high school credit. To receive UConn credit, students must maintain a B average for the year *and* pass the UConn Physics 1201Q Exam at the end of the school year with a grade of 75% or higher.

### Topics (as aligned with textbook)

#### **INTRODUCTION (Chapter 1)**

- Units
- Making Measurements
- Precision vs. Accuracy

### **VECTORS (Chapter 1)**

- Vectors vs. Scalars
- Adding vectors
- Resolving vectors
- Vector Math

### **KINEMATICS (Chapter 2)**

- Displacement, Velocity, and Acceleration
- 4 equations of linear motion
- Graphing motion along a line
- Free Fall

### **PROJECTILES (Chapter 3)**

- Identifying x and y components of displacement and velocity
- Boundary value problems
- 2- and 3-D motion
- Projectiles fired at an angle
- Finding the Range of a projectile fired at an angle

### **NEWTON'S LAWS (Chapter 4)**

- The three laws
- Weight as a force
- The Normal Force
- The concept of *net Force*
- The Free Body Diagram
- Static Equilibrium

### **APPLYING NEWTON'S SECOND LAW (Chapter 4)**

- Special Case: Constant Velocity
- Predicting Accelerations
- Finding Tensions for Moving objects
- Friction and Normal Force
- The Law of Universal Gravitation

### **UNIFORM CIRCULAR MOTION (Chapter 5)**

- Centripetal Acceleration
- Centripetal Force
- Satellites in Circular Orbits
- Vertical Circular Motion

### **WORK, ENERGY AND POWER (Chapter 6)**

- Deriving Equation of Mechanical Energy
- Defining Work, Potential, Kinetic Energies
- Hooke's Law and Energy in a spring

- Non-Conservative Forces and Systems
- Rotational Kinetic Energy
- Potential Energy using Universal Gravitation
- Energy of large (planetary) systems
- Definition of Power

### **IMPULSE AND MOMENTUM (Chapter 7)**

- Derive Impulse/Momentum Equation
- Defining a Closed System
- Conservation of Momentum within a closed system
- Applications of Impulse on a system
- Collisions in two dimensions
- Analyzing motion of center-of-mass

### **ROTATIONAL MOTION (Chapter 8)**

- Introducing radians as a unit of measure
- Understanding angular displacement, velocity, and acceleration
- Using 4 equations of rotational kinematics
- Centripetal acceleration in terms of angles

### **ANGULAR MOMENTUM (Chapter 9)**

- Torque on a rigid body
- Introduction to moment of inertia, “I”
- Examining the relationship between torque and angular acceleration
- Calculating angular momentum

### **SIMPLE HARMONIC MOTION (Chapter 10)**

- Hooke’s Law
- Elastic Potential Energy
- Stress and Strain
- Period and Frequency of objects in Harmonic Motion
- Energy and Harmonic Motion

### **FLUID MECHANICS (Chapter 11)**

- Defining Pressure
- Archimedes’ Principal
- Bernoulli’s Principal

### **TEMPERATURE AND HEAT (Chapter 12)**

- Definitions of Temperature vs. Heat
- Kinetic Theory of Gases
- Heat Transfer
- Thermal Expansion of Solids and Liquids

## **THERMODYNAMICS (Chapter 14 + 15)**

- Absolute Zero Defined
- The ideal gas law reviewed
- Relationship between kinetic energy, temperature, and pressure
- Adiabatic and Isothermal defined
- Heat Pumps and Engines
- The Carnot Cycle
- Entropy Defined

## **WAVES AND SOUND (Chapter 16)**

- Relating Period to Frequency
- The Wave Equation
- Doppler Effects
- Wave Superposition and Interference
- Beat Frequency

## **MIRRORS AND LENSES (Chapter 25)**

- Law of Reflection
- Focal Length defined
- Ray Diagrams for Mirrors
- The Mirror Equation and Magnification

## **REFRACTION (Chapter 26)**

- The Index of Refraction
- Snell's Law
- Special Case: Internal Reflection
- Ray Diagrams for Lenses
- The Lens Equation and Magnification

Disclaimer: *I reserve the right to change this syllabus at any time*