

**PHYSICS****2017-2018**

<b>INSTRUCTOR &amp; EMAIL:</b>	David K Hurd – dhurd@times2.org
<b>ROOM:</b>	Engineering Lab – Room 129
<b>OFFICE HOURS:</b>	2:45-3:45 MWR

**COURSE DESCRIPTION/OVERVIEW:** Physics is a natural science based on experiments, measurements and mathematical analysis with the purpose of finding quantitative physical laws for everything from the nanoworld of the atom to the behavior of the cosmos itself. The traditional topics (Statics, Kinematics, Dynamics, Energy, Thermodynamics, Wave mechanics, Electromagnetism, Nuclear Physics, and Cosmology) will be explored in detail.

**GOALS:** The problem-based learning format of this course will provide the opportunity to develop the basic skills and understanding of content in the areas further described below. Mechanisms for assessment of student performance such as exams and experimentation will provide the opportunity for students to demonstrate the progress they have made in meeting both the content and skills objectives.

**COMMON CORE STANDARDS OVERVIEW:** Covers the NGSS Physical science standards (Structure and properties of matter, Forces and Interactions, Energy, & Waves and Electromagnetic Radiation) as well as the Cosmology component of the Earth and Space Sciences standard.

**CLASSROOM RULES/PROCEDURES:** As per the Times2 STEM Academy handbook.

**GRADING POLICY:** The midterm and final exams will each count for 20% of their respective semester grade. The final grade is the average of the 1<sup>st</sup> and 2<sup>nd</sup> semesters. Each quarter will count for 40% of the semester grade and is scored as follows:

- Category I: Unit tests 40%
- Category II: Lab Reports 25%
- Category III: Homework 25%
- Category IV: Science Fair 10%

**Scope & Sequence**

Sequence	TOPIC(S)	ASSIGNMENT(S)
Unit 1	Kinematics and Free Fall	Lab—Graphing Motion Velocity and Acceleration 2d Galilean Kinematics Free Fall Projectiles Lab—Free Fall
Unit 2	Dynamics - Newton's Laws of Motion	Lab— Newton's Law of Acceleration I Newton's 3 Laws of Motion Statics & Dynamics Dynamics with angles Dynamics including friction Lab—Newton's Law of Acceleration II
Unit 3	Statics	Lab—Static Equilibrium Force Diagrams Static Equilibrium Torque

COURSE SYLLABUS

		Rotational Equilibrium Lab—Rotational Equilibrium
Unit 4	Gravitation & Circular Motion	Lab—Kepler’s Laws Uniform Circular Motion Centripetal Acceleration & Force Newton’s Law of Gravitation Orbital Motion Lab—Centripetal Acceleration
Unit 5	Work, Power & Mechanical Energy	Lab—Mechanical Advantage Work, Power & Simple Machines Kinetic & potential Energy Work-Energy Theorem Conservation of Energy Lab—Conservation of Energy: Rollercoaster
Unit 6	Impulse and Momentum	Lab—Conservation of Momentum (explosion) Impulse and Momentum Conservation of Linear Momentum Elastic & Inelastic Collisions Non Linear Collisions Lab—Collisions in one dimension
Unit 7	Rotational Motion	Lab—Periodic Motion Rotational Velocity and Acceleration Newton’s Laws for Rotation Energy in a Rotating System Momentum in a Rotating System Lab—Conservation of Energy II
Unit 8	Thermodynamics	Lab—The Law of Heat Exchange Temperature and Thermal expansion Effects of heat - Specific heat & Latent Heat Law of Heat exchange Types of Heat Transfer Lab—Calorimetry
Unit 9	Mechanical waves and sound	Lab—Epicenter Activity Properties of Mechanical Waves Resonance on strings Properties of Sound & Doppler effect Resonance of sound Lab—Speed of Sound by resonance
Unit 10	Wave Optics	Lab—Speed of Light (Intro to Snell’s Law) Electromagnetic waves Refraction (Snell’s Law) Interference & Diffraction Diffraction gratings & Thin Films Lab—Wavelength by Diffraction
Unit 11	Electrostatics	Lab—Electrostatics Inquiry Electric charge and Coulomb force Electric fields Electric Potential Electric fields & potential Lab—Millikan experiment
Unit 12	DC Circuits	Lab—Resistors in Series Electric Current and Ohm’s Law Series Circuits Parallel Circuits Combined Circuits and Power

COURSE SYLLABUS

		Lab—Resistance in Parallel
Unit 13	Electromagnetism	Lab—Magnetic Field Lines Magnetic Fields & Electromagnetism Wires & Charged particles in a magnetic field Induced EMF (Faraday's Law) Electric Motors & Generators Lab—Faraday's Law
Unit 14	Nuclear Physics	Lab—Rutherford Scattering Nuclear Structure & Binding Energy Nuclear Decay modes Half-Life & Nuclear Decay curves Nuclear Reactions Lab—Carbon Dating
Unit 15	Optics and Astronomy	Lab—Light Intensity and Inverse Square Law Image Formation & telescopes Astronomical Scale and Mass Spectroscopy & Hubble's Law Cosmology: Stellar Evolution & Big Bang Theory Lab—Stellar Classification