



HONORS PHYSICS

Texts:

1. Kuhn, Thomas S. The Structure of Scientific Revolutions
2. Aristotle. The Physics
3. Einstein, Albert. Relativity: The Special and General Theory
4. Gribbin, John. In Search of Schrodinger's Cat
5. Physics: Principles and Problems. Glencoe MC G

Course Description:

This course is designed to introduce the student to the major ideas in the science of physics from its beginning in the 7th century B.C. Greece to the present. In the course students will read classics in physics, study newtonian mechanics, problem solve and do basic bench labs in physics.

Course Goals:

- 1.) Students will become familiar with the ideas of Thomas S. Kuhn regarding science.
- 2.) Students will read and analyze writings of the physicists Aristotle to Einstein.
- 3.) Students will understand Basic Newtonian Mechanics.

Course Objectives:

- 1.) Students will understand as a process designed to understand the world.
- 2.) Students will be able to solve problems in Newtonian Mechanics using algebra.
- 3.) Students will have a basic understanding of special and general relativity.
- 4.) Students will have a basic knowledge of Quantum Mechanics.

Week 1

- A. The Unscientific Assumption
- B. Thales, Anaximander, Anaximenes
- C. Parmenides, Zeno, Democritus
- D. The pre-paradigm stage

Readings: Kuhn pgs 10-23
Aristotle Book I

Week 2

- A. First Principles
- B. Change
- C. Number of Principles
- D. Relation of physics to mathematics

Readings: Kuhn pgs 23-34
Aristotle Book II Chapters 1-2

Week 3

- A. Causes formal material efficient and final
- B. Chance as cause
- C. Can there actually be an infinity

Readings: Aristotle Book II Chapters 3, 4, 5, 6

Week 4

- A. Natural Place
- B. The Void
- C. The Void and Motion

Readings: Aristotle Book IV Chapters 4, 5, 6, 7, 8, 9

Week 5

- A. What is time?
 - 1. Is time a series of NOWS?
 - 2. Time is a measure of motion

Readings: Aristotle Book IV Chapters 10, 11, 12, 13, 14

Week 6

- A. Motion and Time
- B. Rest
- C. A refutation of motion
- D. Only circular motion is continuous

Readings: Aristotle Book VI

Week 7

- A. All motion has a cause
- B. How motion occurs
- C. Force and Motion

Readings: Aristotle Book VII

Week 8

- A. The heavens move eternally
- B. There is a prime mover

Readings: Aristotle Book VIII

Second Quarter

Week 1

- A. The Aristotelian Paradigm

- B. The Paradigm working Ptoemy
- C. The Paradigm questioned Bacon, Buridan

Readings: Ptoemy, Bacon, Buridan, Kuhn 35-52

Week 2

- A. The paradigm fails---Copernicus
- B. The Crisis---Kepler, Galileo
- C. The Scientific Revolution

Readings: Copernicus, Galileo, Kepler, Kuhn 52-91

Week 3

- A. A new paradigm---Newton
- B. The laws of motion
 - 1. Inertia
 - 2. Accleration
- C. Universal Gravitation
- D. Force

Readings: Principia

Week 4

- A. Momentum
 - 1. Angular Momentum
 - 2. Conservation of Momentum

Readings: Problem Solving

Week 5

- A. Work
- B. Work and Machines

Readings: Problem Solving

Week 6

- A. Energy
 - 1. Kinetic Energy
 - 2. Potential Energy

Readings: Problem Solving

Week 7

- A. Heat
- B. Laws of Thermodynamics
- C. Change of State

Readings: Problem Solving

Week 8

- A. Waves

1. Types of Waves
2. Diffraction
3. Reflection, Refraction, and Interference

Readings: Problem Solving

Third Quarter

Week 1

- A. Light
- B. Wave or Particle
- C. Thompson: Light is a Wave

Readings: Principles and Problems Ch. 6

Week 2

Electricity and Magnetism

Readings: Principles and Problems Ch. 25-26

Week 3

- A. The Field Equations
 1. James Clerk Maxwell
 2. The Electro-magnetic wave

Week 4

- A. There is something wrong with Light
 1. Michelson – Morley Experiment
 2. H.A. Lorentz and his magic equations

Week 5

- A. Uncle Albert
 1. Special Theory
 2. What it means
 - a. for space
 - b. for time

Readings: Relativity pgs. 1-64, Kuhn pgs. 111-136

Week 6

- A. More with Uncle Albert
 1. General Theory
 2. Physicists trapped in an elevator car

Readings: Einstein pgs. 67-128

Week 7

A. Is Newton wrong?

1. Why keep him if he's wrong?

Fourth Quarter

Week 1

A. There is something wrong with Light, Again!

1. Max Planck and the Quantum
2. Uncle Albert and the Photo-electric effect

Readings: Principles and Problems Ch. 27

Week 2

A. Niels Bohr and the Quantum Atom

Readings: Principles and Problems Ch. 28

Week 3

A. Die WunderKinder

1. Werner Heisenberg
2. Wolfgang Pauli
3. Paul Dirac
4. Erwin Schrodinger
5. Louis De Brogile

Readings: Gribbin pgs. 7-51, 53-105, 105-122

Week 4

A. The Copenhagen Interpretation

1. Living with uncertainty
2. Einstein refuses
3. Schrodinger's Cat

Readings: Gribbin pgs. 123-159

Week 5

A. Cooking with Quanta

1. Lasers, Masers, Phasers
2. Transistors and Super Conductors

Readings: Principles and Problems pgs. 670-687

Week 6

A. A Quark for Mr. Arc

1. The Nucleos
2. The Quark model and Neutron decay
3. Alpha, Beta, Gamma

Readings: Principles and Problems pgs. 716-722

Week 7

A. The Universe in a Quantum Shell

1. The Big Bang.
2. Gut
3. Could Einstein be wrong too?

Readings: Gribbin pgs. 159-275

Week 8

A. String Theory

1. Like an ant on a string
2. 11 Dimensions
3. Had Physics returned to a pre-paradigm state?
4. Awaiting a new paradigm of physics