Last Revised on November 28, 2011

Physical Science 102

Syllabus for Spring 2012

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Course Number: PHS 102

Course Title: Physical Science II

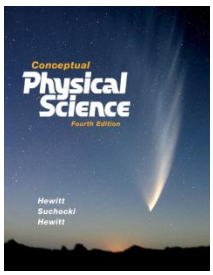
Prerequisite: PHS 101* with a minimum grade of "C."

Course Description:
This is the first of a sequence of courses in physical science and includes an introduction to science with emphasis on science terminology and investigations of the physical world. Topics are selected from astronomy, chemistry, geology and physics. This course will focus on the following topics: matter, motion, energy, work, power and introduction to chemistry. The following topics will be covered to a lesser degree: machines, electricity, fluid mechanics, heat transfer, thermal expansion, heat and phase change, thermodynamics, and the generation and application of various energy sources.

General Course Outcomes:
Students who complete the general education core curriculum should be able to demonstrate

1. rationality, logic, and coherence through critical thinking;
2. their ability to express themselves effectively in quantitative and qualitative terms;
3. the scientific method of inquiry;
4. their ability to access, retrieve, synthesize, and evaluate information.

Textbook: Paul G. Hewitt, John A. Suchocki, Leslie A Hewitt, Conceptual Physical Science, 4th edition, Addison-Wesley. 2008



Lab Manual: SCC Laboratory Manual for Physical Science 102

Required tool: Scientific calculator capable of scientific notation and exponential functions

Method of Instruction: The class will be taught by lecture and class participation in laboratories. Materials and assignments may require access to the college website.

Grading System:

90	-	100	=	A
80	-	89	=	B
70	-	79	=	C
60	-	69	=	D
Below	-	60	=	F

Attendance Policy:
Students are responsible for punctual and regular attendance in all classes, laboratories, field trips, and other class activities. Full explanation of the school attendance policy is in the Student Handbook. Section-specific policies will be described in the instructor's syllabus addendum. For the Spring 2012 semester, the last day to withdraw from full-term courses is April 2. Students are responsible for being aware of all college and course-specific deadlines, including any changes in the withdrawal deadline. Students are encouraged to refer to the college website for further information regarding deadlines.

Classroom Conduct:
Students are expected to uphold the integrity of the College's standard of conduct, specifically in regards to academic honesty. All forms of academic dishonesty including, but not limited to, cheating on assignments/tests, plagiarism, collusion, and falsification of information will call for disciplinary action. Disciplinary action imposed may include one or more of the following: written reprimand, loss of credit for assignment/test, termination from course, and probation, suspension, or expulsion from the College. For further explanation of this and other conduct codes, please refer to the Student Handbook.

Accommodations:
Students who need special accommodations in this class because of a documented disability should notify Student Disability Services by calling (864) 592-4818, toll-free 1-800-922-3679; via email through the SCC web site at www.sccsc.edu/resources/disabilities; or by visiting the office located in the East Building Room 30-B on the SCC Central campus. Contacting Student Disability Services early in the semester gives the College an opportunity to provide necessary support services and appropriate accommodations.

Additional Policies
Instructors may choose to supplement the information in this syllabus. Students are responsible for making sure they receive a copy of any syllabus addendum the instructor may provide.

Course Competences & Objectives:
Upon satisfactory completion of this course, the student will be able to do the following:

Chapter 0: Unit of Measurement in Metric System
- Recognize and use the units of the metric system for length, mass, volume.
- Convert between the metric and the English systems for length, mass, volume.
- Write numerical quantities with the correct number of significant figures and units.
- Manipulate units algebraically and make unit conversions using MKS system.
- Write numerical quantities in scientific notation.

Chapter 8: Electrostatic and Electric Current
- Define the fundamental property known as electric charge.
- Use Ohm's law to solve problems that involve the current in a circuit, the resistance of the circuit, and the voltage across the circuit.
- Describe electrical forces between objects.
- Describe Coulomb's law.
- Distinguish between a conductor and an insulator.
- Describe how an insulator can be charged by charge polarization.
- Describe the factors that affect the resistance of a wire.
- Distinguish between DC and AC.

- Define the term "electric potential difference" or "voltage" between two points in an electric field, and its corresponding unit of measure, the "volt".
- Demonstrate an understanding of the difference between parallel and series circuits.
- Determine the household energy consumption in terms of electric power ratings and cost per kilowatt-hour.

Chapter 9: Magnetism and Electromagnetic Induction

- Describe magnetic fields using the concepts of magnetic field lines and magnetic poles.
- Describe what is meant by a magnetic field and discuss how it can be pictured by field lines.
- State the connection between electric charges and magnetic fields.
- Describe the force a magnetic field exerts on an electric current.
- Describe what happens to the magnetic domains of iron in the presence of a strong magnet.
- Describe the magnetic field produced by a current-carrying wire.
- Describe how a magnetic field exerts a force on a charged particle in the field.
- Describe how voltage is induced in a coil of wire.
- State and explain Faraday's and Lenz's law.
- Describe how a transformer works.
- Describe electromagnetic waves.
- Demonstrate an understanding of Earth's magnetic field.

Chapter 10: Waves and Sound

- Diagram and label the parts of a wave.
- Understand the general properties of both transverse and longitudinal waves.
- State what the Doppler effect is and explain its origin.
- Show how standing waves are formed and how their presence can be related to *resonance*.
- Describe factors that affect the speed of a wave.
- Distinguish between constructive and destructive interference.
- Describe bow waves.
- Describe sonic booms.
- Relate the pitch of a sound to its frequency.
- Describe the movement of sound through air.
- Compare the transmission of sound through air with that through solids, liquids, and a vacuum.
- Describe factors that affect the speed of sound.
- Describe loudness and sound intensity.
- Give examples of forced vibration.
- Describe natural frequency.
- Describe resonance.
- Describe beats.
- Describe what determines the musical quality of a note.

Chapter 11: Light

- Explain how a mirror produces an image.
- Explain what is meant by the refraction and the reflection of waves.
- Explain how refraction makes a body of water seem shallower than it actually is.
- Explain what is meant by internal and total reflection.
- Define lens and distinguish between converging and diverging lenses.
- Describe the differences between farsightedness, near sightedness, and astigmatism.
- Account for the dispersion of white light into a spectrum when it is refracted.
- Discuss the origin of rainbows.
- Explain why the sky is blue.
- Distinguish between constructive and destructive interference.
- Explain why thin films of soap or oil are brightly colored.
- Describe the diffraction of waves at the edge of an obstacle.

- Describe the effect of diffraction on the sharpness of the images produced by optical instruments.
- Distinguish between diffuse and regular reflection and tell when each will occur.
- See how light can be polarized and what useful things can be done with polarized light.
- Show how the reflection of light from the surfaces of plane and spherical mirrors can produce real and virtual images.
- Determine how lenses can focus light rays and how they can be used to correct vision defects.

Chapter 13: The Atomic Nucleus

- Write equations for nuclear reactions and calculate the energy released in these reactions.
- Distinguish between the processes of nuclear fission and nuclear fusion and discuss the advantages, disadvantages, and dangers of each as commercial power sources.
- Define half-life.
- Explain the significance of the binding energy of a nucleus.
- Draw a graph of binding energy per nucleon versus mass number and indicate on it the location of the most stable nucleus and the range of mass numbers in which fusion and fission can occur.
- Discuss nuclear fission and the conditions needed for a chain reaction to occur.
- Describe how a nuclear reactor works.
- Describe nuclear fusion.

Chapter 18: Two types of Chemical Reactions (part II)

- Define the oxidation and oxidizing agent
- Define the reduction and reduction agent
- Explain electrochemistry and electrolysis
- Define the combustion and corrosion
- Explain the principles exemplified in a battery

Chapter 20: Rocks and Minerals

- Name and describe some of the most abundant minerals found in Earth's crust.
- State the basic physical properties that can be used to identify mineral samples.
- Distinguish the physical properties that are useful in identifying minerals.
- Distinguish the chemical characteristics that are useful in identifying minerals.
- Distinguish between rocks and minerals.
- List and distinguish among the common silicate minerals.
- Describe the chemical classification of minerals.
- Distinguish among igneous, sedimentary, and metamorphic rocks.
- List and describe the characteristics of intrusive/extrusive igneous rocks.
- Explain how new sedimentary rocks can be formed from the remains of previous rocks.
- Describe the processes by which sediments become rock.
- Differentiate between foliated and non-foliated metamorphic rocks.
- Describe several metamorphic rocks and give their origins.
- Draw a diagram that shows the rock cycle.

Chapter 22: Plate Tectonics and Earth's Interior

- Identify the various layers of the Earth, and contrast them in terms of their thickness, composition, density, and seismic behavior.
- Discuss the characteristics of the crust.
- Discuss the properties and composition of the mantle.
- Discuss seismological and other evidence that indicates that the outer core is liquid.
- Understand what is meant by the term Mohorovicic Discontinuity.
- Contrast the asthenosphere and lithosphere.
- Define isostasy and tell how this concept can explain the variations in elevation between mountains and the seafloor.

- Distinguish among the four kinds of earthquake waves.
- Explain how ocean-floor spreading accounts for present-day features of the ocean floors.
- Identify the San Andreas Fault and indicate its origin.
- Explain the basics of the theory of plate tectonics.
- Discuss the major evidence in support of the theory of plate tectonics.
- List the three types of plate boundaries and describe the type of motion involved at each.
- Explain what Pangea was.

Chapter 26: The Solar System

- Discuss the origin of our solar system and comment on the possibility of the existence of additional solar systems associated with other stars in the universe.
- Distinguish between the rotation and revolution of a planet and state the two regularities of these motions shared by most planets and satellites.
- Identify the inner and outer planets and list the common properties of the members of each group.
- Discuss why Pluto does not fit into either of the above groups.
- Give the two causes of the deflection of comet tails so they always point away from the sun.
- Describe how Venus is environmentally different from earth.
- Describe the Great Red Spot of Jupiter.
- Discuss the nature of Saturn's rings and explain how this was discovered before spacecraft visited Saturn.
- List the names of the planets, in order, from the Sun outward.
- Describe surface features and atmospheric characteristics of the planets in our solar system.
- Distinguish between comets, asteroids, meteors, and meteorites.
- Describe the orbit of a comet, and the orientation of the comet's tail.
- Describe the orbit of asteroids.
- Explain briefly how the moon is related to eclipses and tides.
- Discuss the scientific interpretation of the origin of the Moon.
- Explain the nature of the Moon's orbit around the Earth.
- Be able to sketch the phases of the moon.
- Explain the orientation of the Earth-Moon-Sun system for each phase.
- Distinguish between solar eclipses and lunar eclipses.
- Describe the alignment of the sun, earth and moon during a solar eclipse.
- Describe the alignment of the sun, earth and moon during a lunar eclipse.
- Explain the phase of the moon at which each type of eclipse occurs.

Chapter 27: The Stars

- Show how the celestial sphere can be used to find the positions of objects in the sky.
- Understand how stars are classified and formed and how they proceed through well-defined life cycles as they burn up their nuclear fuel.
- Describe how analyzing the spectrum of a star can provide information on the star's structure, temperature, composition, condition of matter, magnetism, and motion.
- Identify the basic process that gives rise to solar energy.
- Describe how the elements more massive than hydrogen are created and distributed throughout the universe.
- Define light-year.
- Describe the parallax method of finding the distance to a star.
- Describe how the distance to a star can be found by comparing its apparent and intrinsic brightness.
- Draw a Hertzsprung-Rusell (H-R) diagram and indicate the positions of main-sequence stars, red giants, and white dwarfs.
- Compare the properties of red giants and white dwarf stars.
- Outline the life history of an average star like the sun.

- Outline the life history of a very massive star.
- State what a supernova is.
- Define neutron star and pulsar and discuss the connection between them.
- Describe what black holes are and explain how they can be detected.

Chapter 28: Cosmology

- Describe the groupings of stars into gigantic "island universes" called galaxies.
- Trace the history of our universe from its conception in the Big Bang to its present-day structure, using our current knowledge of cosmology.
- Explain what red shifts in galactic spectra indicate about the motions of galaxies.
- State Hubble's law and use it as evidence for the expansion of the universe.
- Outline the properties of quasars and what they suggest about the nature of these objects.
- Explain what is meant by the big crunch and why the average density of the universe is such an important quantity.
- Explain the significance of the uniform sea of radio waves that fills the universe.