



**COWLEY COLLEGE  
& Area Vocational Technical School**

**COURSE PROCEDURE FOR**

<p><b>PHYSICAL SCIENCE PHS4511      5 Credit Hours</b></p>
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**Student Level:**

This course is open to students on the college level in the freshman or sophomore year.

**Catalog Description:**

**PHS4511 - PHYSICAL SCIENCE (N) (5 hrs)**

**[KRSN PSI 1010/1011/1012]**

A non-technical course intended for students who are majoring in fields other than science. The application of scientific knowledge to daily life activities is emphasized by examining the fundamental principles in physics, chemistry, geology, and astronomy utilizing the scientific method.

**Prerequisite:**

None

**Course Objective:**

This course is a non-technical course offered for students majoring in fields other than science and for students who have a limited science background. This course provides students with knowledge of the basic concepts of physical science and applications of those concepts as they relate to the student's daily life activities. In addition, students learn to analyze problems through utilization of the scientific method.

**Learner Outcomes:**

Upon completion of this course, the student will gain knowledge of the scientific method and how it is utilized to solve problems. In addition, the student will read about, understand and successfully apply concepts related to properties of matter, energy and heat, electricity and magnetism, sound and light, chemistry, the nucleus and radioactivity, geology and astronomy in their significance to the students daily life activities.

**Core Outcomes:**

The learning outcomes and competencies detailed in this course outline or syllabus meet or exceed the learning outcomes and competencies specified by the Kansas Core Outcomes Groups project for this course as approved by the Kansas Board of Regents.

**Units Outcomes and Criterion Based Evaluation Key for Core Content:**

The following defines the minimum core content not including the final examination period. Instructors may add other content as time allows.

Evaluation Key:

- A = All major and minor goals have been achieved and the achievement level is considerably above the minimum required for doing more advanced work in the same field.
- B = All major goals have been achieved, but the student has failed to achieve some of the less important goals. However, the student has progressed to the point where the goals of work at the next level can be easily achieved.
- C = All major goals have been achieved, but many of the minor goals have not been achieved. In this grade range, the minimum level of proficiency represents a person who has achieved the major goals to the minimum amount of preparation necessary for taking more advanced work in the same field, but without any major handicap of inadequacy in his background.
- D = A few of the major goals have been achieved, but the student's achievement is so limited that he is not well prepared to work at a more advanced level in the same field.
- F = Failing, will be computed in GPA and hours attempted.
- N = No instruction or training in this area.

<b>UNIT 1: SCIENTIFIC METHOD AND MEASUREMENT</b>						
Outcomes: Upon completion of this unit, the student will be able to describe the nature of science as a dynamic, ever-changing body of knowledge that is shaped through the use of the scientific method. The student will also gain insight into the fundamental nature and structure of matter and the universe.						
A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Know the steps in the scientific method.
						Identify the scientific method at work in the development of the current model of our universe and in the development of the model of the atom.
						Understand the importance of mathematics and measurement in science.
						Distinguish between fact, law, theory and hypothesis.
						Appreciate the importance of honesty, integrity and proper procedure in the reporting of scientific findings.
						Understand the origin and significance of the law of universal gravitation.

**UNIT 2: MOTION**

Outcomes: Upon completion of this unit, the student will be able to adequately describe linear motion, circular motion and Newton's laws of motion.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Understand and apply the concepts of average and instantaneous speed.
						Understand and apply the concept of circular motion.
						Understand and apply the concepts of force and Newton's laws of motion.
						Understand and apply the Newton's law of gravitation.

**UNIT 3: ENERGY AND HEAT**

Outcomes: Upon completion of this unit, the student will be able to adequately describe the basic concepts related to energy and heat.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Identify examples of kinetic energy and potential energy and show how they relate to the law of conservation of energy.
						Give examples of substances with high and low specific heat capacities and relate behaviors of these substances to their respective specific heat capacities.
						Give examples of heat transfer through each of the three heat transfer mechanisms: conduction, convection and radiation.
						Explain the Greenhouse effect. Include an understanding of the importance of the greenhouse effect to our environment and the role of thermal and environmental pollution in the potential development of global warming.
						Appreciate the problems involved in the generation of electricity by solar power.
						Apply concepts of heat and energy to weather, especially to violent storms such as tornadoes and hurricanes.

**UNIT 4: ELECTRICITY AND MAGNETISM**

Outcomes: Upon completion of this unit, the student will be able to adequately describe the basic concepts related to electricity and magnetism.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Identify the fundamental source of electricity.
						Identify the fundamental source of magnetism.
						Compare and contrast Newton's Law of Gravitation for masses with Coulomb's Law for electric charges.
						List sources of potential difference (voltage).
						Identify the unit of measurement for electrical quantities: potential difference, resistance, current, power, electric charge.
						Appreciate the importance of the development of superconductors.
						Distinguish between series and parallel circuits. Identify types of circuits found in household wiring. Explain the need for circuit breakers or fuses.
						Explain how a magnet can be made and explain how a magnet can be weakened.
						Appreciate the importance of electromagnetic induction and briefly outline how electricity is produced.

**UNIT 5: SOUND AND LIGHT**

Outcomes: Upon completion of this unit, the student will be able to adequately describe the basic concepts related to sound and light.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Distinguish between and give examples of transverse waves and longitudinal waves.
						Know the speed of sound at room temperature and the speed of light in a vacuum.
						Give examples of resonance.
						Explain the origin of the Doppler effect and give examples of how the Doppler effect is used in our society.

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Outcomes: Upon completion of this unit, the student will be able to adequately describe the basic concepts related to sound and light.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Identify characteristic sections of the electromagnetic spectrum and list these sections in order of increasing energy.
						Describe modern technology that is based on the property of total internal reflection.
						Identify significant parts of the human eye and explain how light is processed by each part.
						Explain the significance of the photoelectric effect, both in theory and in the design of practical devices.

**UNIT 6: BASICS CONCEPTS OF CHEMISTRY**

Outcomes: Upon completion of this unit, the student will be able to adequately describe the basic concepts of chemistry.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Explain the contribution of each of the following to the development of modern chemistry: Democritus, Aristotle, Boyle, Lavoisier, Priestly, Dalton, Avogadro.
						Understand and apply the concept of conservation of mass.
						Distinguish between physical properties/changes and chemical properties/changes.
						Identify elements, compounds and mixtures.
						Know characteristics of ionic, covalent and metallic bonds.
						Describe the difference between homogeneous and heterogeneous mixtures and between homogeneous mixtures and suspensions.

**UNIT 7: THE ATOMIC NUCLEUS AND RADIOACTIVITY**

Outcomes: Upon completion of this unit, the student will be able to adequately describe the basic concepts related to the atomic nucleus and radioactivity.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Understand the fundamental difference between alpha and beta rays and gamma rays.
						Explain the similarity and difference among isotopes of an element. Support with an example.
						Appreciate the importance of the strong nuclear force.
						Understand the difference between natural and artificial transmutation.
						Briefly describe the carbon-14 dating technique. Give an example. Explain any problems with this method.
						Appreciate the risks of radiation exposure from activities in our society and natural substances in our environment.
						List advantages and disadvantages of future development and use of nuclear fusion to produce electric power.

**UNIT 8: EVER-CHANGING EARTH**

Outcomes: Upon completion of this unit the student will be able to explain the forces that are responsible for the changes the earth has experienced over the course of history that account for the features that are currently present on the earth's surface, and the student will be able to predict changes that the earth will experience in the future based on these same forces.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						List four natural phenomena that are constantly at work which change the surface of our planet.
						Draw a cross-section of the earth and label the various layers of the earth's interior.
						Describe the difference between dip-slip and strike-slip faults.
						Outline the theory of Continental Drift. Include evidence that supports this theory.

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A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Outline the Theory of Plate Tectonics. Include evidence that supports this theory.
						Define "ring of fire" and explain its origin.
						Appreciate how tectonic interactions have changed the earth's surface.

**UNIT 9: ASTRONOMY**

Outcomes: Upon completion of this unit the student will be able to describe basic features of our solar system, galaxy and universe, and realize that this science is only in its infancy. In addition, the student will gain an appreciation for the size of the universe as well as participate in reflection upon the origin of the universe.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Explain why we see only one side of the moon.
						Understand the origins of lunar and solar eclipses.
						List the eight planets of our solar system in order of increasing distance from the sun. Include the location of the asteroid belt.
						Know two or three distinguishing characteristics of each planet.
						Explain why different constellations appear in the night sky at different times of the year.
						Compare and contrast the life cycles of small stars and larger stars.
						Give an estimate of the number of galaxies present in our universe.

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A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Define "The Big Bang". List evidence that supports the Big Bang Theory.

**Projects Required:**

The student will participate in classroom laboratory activities and prepare reports appropriate to these activities. Complete at least 20 experiments related to the nine units from page 8 of this course outline.

**Text Book:**

Contact the Bookstore for current textbook.

**Materials /Equipment Required:**

Metric Balance, graduated glassware, optics equipment, HeNe laser, iron magnets, electromagnets, electric circuit board, geiger counter, tuning forks, spectrum tubes of various elements, electroscope, spectroscope.

A scientific calculator is required; a graphing calculator is recommended. Access to a computer would be helpful.

**Attendance Policy:**

Students should adhere to the attendance policy outlined by the instructor in the course syllabus.

**Grading Policy:**

The grading policy will be outlined by the instructor in the course syllabus.

**Maximum class size:**

Based on classroom occupancy

**Course Timeframe:**

The U.S. Department of Education, Higher Learning Commission and the Kansas Board of Regents define credit hour and have specific regulations that the college must follow when developing, teaching and assessing the educational aspects of the college. A credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally-established equivalency that reasonably approximates not less than one hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work for approximately fifteen weeks for one semester hour of credit or an equivalent amount of work over a different amount of time. The number of semester hours of credit allowed for each distance education or blended hybrid courses shall be assigned by the college based on the amount of time needed to achieve the same course outcomes in a purely face-to-face format.

**Refer to the following policies:**

[402.00 Academic Code of Conduct](#)

[263.00 Student Appeal of Course Grades](#)

[403.00 Student Code of Conduct](#)

**Disability Services Program:**

Cowley College, in recognition of state and federal laws, will accommodate a student with a documented disability. If a student has a disability which may impact work in this class which requires accommodations, contact the Disability Services Coordinator.