

# College of Micronesia-FSM

## COURSE OUTLINE COVER PAGE

<b>Physical Science</b>		<b>SC 130</b>
<b>Course Title</b>		<b>Department and Number</b>

**Course Description:** A general overview of physical science which includes the study of motion, force, energy, matter, electricity, light, magnetism, basic chemistry, and astronomy

<b>Course Prepared by:</b>	Relinda C. Abellera	<b>State</b>	Pohnpei National Campus
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		Hours per Week		No. of Week		Total Hours		Semester Credits
<b>Lecture</b>		3	x	16	x	48/16	=	3
<b>Laboratory</b>		3	x	16	x	48/48	=	1
<b>Workshop</b>			x		x		=	
					Total Semester	Credits		4

<b>Purpose of Course:</b>	Degree Requirement	<b>X</b>
	Degree Elective	
	Certificate	
	Other	

<b>Prerequisite Course(s):</b>	ESL 089 Reading V and a "C" or better in MS 098 Transition to Algebra [Modified 4/19/2005].		
<b>Signature, Chairperson, Curriculum Committee</b>		<b>Date Approved by Committee</b>	
<b>Signature, President, COM-FSM</b>		<b>Date Approved by President</b>	

1. Science Program Outcomes

**Students will be able to:**

- **explain** and apply natural laws, theories and processes that model the natural world.
- **use** the scientific method of inquiry and standard scientific techniques to answer questions about physical, biological, or social processes.
- **demonstrate** how experimentation (or other forms of data collection), and peer review, are used in the production of scientific knowledge and how this differs from other kinds of knowledge.
- **interpret** and express the results of experiments.
- **differentiate** between science and technology and develop the abilities of technological design.

2. General Objectives (Course outcomes)

**Students will be able to:**

- A. Apply mathematics to model physical and social processes which they encounter in professional, vocational, and everyday settings.
- B. Describe the basic physical laws of motion, gravity, electricity, and magnetism.
- C. Define and explain basic principles, concepts, and theories of the natural sciences (e.g. energy, thermodynamics and waves).
- D. Give the importance of organic chemicals in everyday life.
- E. Explain basic principles and concepts in Astronomy, Meteorology, and Geology.

3. Specific Objectives (Specific outcomes)

**Students will be able to:**

- A. Apply mathematics to model physical and social processes which they encounter in professional, vocational, and everyday settings.
  1. Distinguish between fundamental quantities, standard units, and derived units.
  2. Discuss some of the various systems of units that are currently in use.
  3. Convert measurements from one system of units into another system, or from one unit to another within a given system.
  4. Solve mathematical operations involving significant figures, scientific notations, and rounding off numbers.
  5. Read and interpret scientific and technical information: verbal, mathematical, and graphical.
- B. Describe the basic physical laws of motion, gravity, electricity, and magnetism.
  6. Define vectors and scalars when describing the motion of an object.
  7. Discuss the physical processes and theories that are involved in the study of motion.
  8. Identify the units in which each of the concepts of motion is expressed.
  9. Distinguish among straight-line motion, uniform circular motion, and projectile motion.
  10. Define force and momentum.
  11. Describe how changes in the motion of objects correlate with the forces that cause these changes.
  12. Explain that the application of forces to objects follows three simple laws formulated by Isaac Newton, and be able to state and explain these laws.
  13. Distinguish between *weight* (a gravitational force) and *mass* (the quantity of matter), and tell how these are related to each other near the surface of Earth.
  14. State the conservation laws that apply to *linear momentum* and *angular momentum*, and give examples of each.
  15. Define the fundamental property known as electric charge.
  16. Explain how and when electric charge can move from one place to another and thereby produce electric current.
  17. Describe magnetic fields using the concepts of magnetic field lines and magnetic poles.
  18. Explain how the control of electron flow in circuits forms the basis for today's high-technology lifestyle.
- C. Define and explain basic principles, concepts, and theories of the natural sciences (e.g. energy, thermodynamics, and waves).
  19. Define the conservation of energy law and give its importance in the overall scheme of physical science.
  20. Define work and energy.

21. Perform calculations using the concepts of work, energy, and power.
  22. Differentiate among the various types of energy, and tell how they are alike and how they differ.
  23. Determine the amount of power required to do a certain amount of work in a given period of time.
  24. Distinguish between heat and temperature and explain the units involved with each.
  25. Explain how temperature scales are set up and how to convert temperature readings between scales.
  26. Compare the Fahrenheit scale with the Celsius scale.
  27. Define specific heat and latent heat
  28. Tell how heat can be transferred through various forms of matter or even through empty space.
  29. Explain how solids, liquids, and gases differ, and be able to describe how the behavior of gases can be explained using the kinetic theory of molecules.
  30. Discover how kinetic energy in gases can serve as a model for understanding heat and pressure effects in all phases of matter.
  31. Define the three laws of thermodynamics and how they apply to such diverse processes as heat engines and refrigerators.
  32. Discuss the general properties of waves.
  33. Describe electromagnetic waves and list the various types of transverse waves.
  34. Distinguish between longitudinal and transverse waves.
  35. Discuss sound waves in detail and understand their general properties and the way they propagate through air.
  36. Identify the terms to describe waves.
  37. Distinguish between diffuse and regular reflection and tell when each will occur.
  38. Explain how light is refracted when it penetrates a new medium and how this can lead to the formation of a spectrum of colors.
  39. Describe how light can be polarized and what useful things can be done with polarized light.
  40. Describe the interaction of two or more light waves as they are added together and how this can cause both constructive and destructive interference.
  41. Explain under what conditions light can be defracted around sharp edges or through narrow slits.
  42. Explain how the reflection of light from the surfaces of plane and spherical mirrors can produce real and virtual images.
  43. Determine how lenses can focus light rays and how they can be used to correct vision defects.
  44. Explain why a new theory known as the "dual nature of light" was required to explain the fact that light sometimes must be depicted as a wave and sometimes as a particle.
  45. Explain how the particle theory of light was used by Niels Bohr to explain the structure of the atom and the emission line spectra produced by gas-discharge tubes.
  46. Explain how the quantum aspects of electromagnetic radiation led to the explanation of line emission spectra and to the development of microwave ovens, lasers, and modern X-ray tubes.
- D. Give the importance of organic chemicals in everyday life.
47. Identify the most common elements in our environment
  48. Name some of the basic inorganic compounds, and write their chemical formulas.
  49. Explain the ways in which matter is classified by chemists.
  50. Distinguish among types of solutions and tell how they form.
  51. Explain the basic structure of an atom and of its nucleus.
  52. Describe the three most common modes of radioactive decay and understand the concept of radioactive half-life.
  53. Write equations for nuclear reactions and calculate the energy released in these reactions.
  54. Distinguish between the processes of nuclear fission and nuclear fusion and discuss the advantages, disadvantages, and dangers of each as commercial power sources.
  55. Discuss the role of energy in chemical reactions and explain how various factors can

affect reaction rate.

56. Define the law of conservation of mass as it applies to chemical reactions.
57. Describe basic types of chemical reactions
58. Describe the processes of ionic, covalent, and hydrogen bonding and be able to write the formulas for compounds formed by the first two processes.
59. Name the compounds made from metals that can bond in more than one ionic form.
60. Balance simple chemical equations.
61. Distinguish between the physical and the chemical properties of substances, and tell how chemical reactions can change these properties.
62. Explain the differences between oxidation and reduction.
63. Differentiate between acids and bases and tell the properties of each.
64. Use the law of definite proportions and see how this law leads to the assignment of unique formula masses to compounds
65. Explain the bonding structure of molecules in organic compounds.
- E. Explain basic principles and concepts in Astronomy, Meteorology, and Geology.
  66. Describe how our planet Earth moves through space and responds to the gravitational pull of the Sun and other nearby celestial objects.
  67. List the other planets that orbit the Sun, show that they follow Kepler's laws, and tell how they fit into the general structure of our solar system.
  68. Distinguish between the terrestrial and Jovian planets and give general descriptions of each planet and its associated satellites.
  69. Explain how asteroids and comets fit into the overall description of our solar system.
  70. 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.
  71. Establish the basis for our current time measurements and relate them to the astronomical processes by which they were originally defined.
  72. Show how the seasons of the year are related to the tilt of Earth's axis with respect to its plane of revolution around the Sun and also how the seasons are linked to the vernal equinox.
  73. Discuss the precession of Earth's axis and explain what consequences this phenomenon will have for future generations.
  74. Explain how the calendar has evolved over the years and how our current calendar adjusts to irregularities in the length of the solar day upon which it is based.
  75. Describe the general features of the Moon, along with its special relationship to our planet Earth.
  76. State the current theories that best explain the origin of the Moon, and trace its extraordinary history up to the present day.
  77. Describe and explain the origin of the various surface features of the Moon.
  78. Explain how the motion of the Moon leads to such diverse phenomena as monthly phases, solar and lunar eclipses, and the tides in the oceans on Earth.
  79. List the physical characteristics of the Sun and explain its inner workings.
  80. Show how the celestial sphere can be used to find the positions of objects in the sky and how declination and right ascension define these positions.
  81. Understand how stars are classified and formed and how they proceed through well-defined life cycles as they burn up their nuclear fuel.
  82. Describe the groupings of stars into gigantic "island universes" called galaxies.
  83. Trace the history of our universe from its conception in the Big Bang to its present-day structure, using our current knowledge of cosmology.
  84. Describe the origin, characteristics, and composition of the air envelope, called the atmosphere, that surrounds Earth.
  85. Distinguish among the different regions of the atmosphere as a function of altitude and tell how energy plays a key role in its dynamic nature.
  86. Tell how scientists keep track of conditions and changes in our atmosphere, and what characteristics they measure to do so.
  87. Distinguish between air currents and wind, and explain what forces are responsible for each.

88. Describe local winds, and show how the general wind circulation on Earth produces a predictable overall pattern.
89. Explain the formation of the jet streams and other upper atmospheric wind processes.
90. Tell how clouds are classified, and name the most general types.
91. Discuss the mechanisms by which clouds form and dissipate.
92. Explain how precipitation can form, and identify the most common kinds.
93. Name the various types of air masses and describe their source regions, then show how frontal regions move and how they affect our weather.
94. Describe the various types of storms that can occur in our atmosphere, and tell the conditions under which these storms can form.
95. Identify the sources of the major pollutants that threaten our environment, and explain how pollution can affect our weather and climate.
96. Distinguish between minerals and rocks.
97. Name and describe some of the most abundant minerals found in Earth's crust.
98. State the basic physical properties that can be used to identify mineral samples.
99. Identify the physical properties of minerals, and list their general uses.
100. Describe the three classes of rocks.
101. List the common types of rocks.
102. Identify how rocks are formed.
103. Explain the rock cycle.
104. Explain the classification of common igneous rocks.
105. Explain how new sedimentary rocks can be formed from the remains of previous rocks.
106. Describe the origin of metamorphic rocks.
107. Discuss the processes by which existing rocks can be changed by chemicals, heat, and pressure into different metamorphic forms.
108. Describe the general processes of erosion, including weathering and mass wasting.

**Textbook:** Shipman, J.T., Wilson J. D., and Todd, A. W. An Introduction to Physical Science- 10<sup>th</sup> edition. Houghton Mifflin Co., New York. 2003.

**Required course materials:** text, laboratory and demonstration equipment, internet links, and library

**Reference materials:** Payne, Charles A., Falls, William R., and Whidden, Charles J. Physical Science (Principles & Application) 6<sup>th</sup> edition. WCB Publishing Co., USA. 1992.

Ebbing, Darrell D & Wentworth, R.A.D. Introductory Chemistry. 2<sup>nd</sup> edition. Houghton Mifflin Co., New York. 1998.

Physical Science Laboratory Manual compiled by Relinda C. Abellera, 2003.

**Instructional costs:** None anticipated at this time

**Teaching Methods Employed:** lecture, discussion, classroom demonstrations, laboratory investigations, student activities, and video clips

**Evaluation and assessment:** quizzes, homework, laboratory reports, mid-term and final exam will be given.

**Credit by examination:** None

**Attendance policy:** The COM-FSM policy will be enforced