SCIENCE DEPARTMENT **SCI-TECH (SP): COURSE #452**

(Alternate Year Offering: See the Program of Studies)

The Department's Educational Philosophy

We believe that students should be exposed to the process of scientific inquiry so they can acquire and interpret scientific knowledge, and begin to realize the wider applicability of scientific problem-solving methods. By making the laboratory the focal point of learning, we seek to foster students' appreciation for the experience of doing science.

Guiding Principles

- Students must be able to collect and analyze data and formulate hypotheses.
- Inductive and deductive problem-solving skills are central to science education.
- An effective program in science addresses the limitations of data and conclusions.
- Students should be able to use or design a strategy for testing scientific concepts.
- A comprehensive science program will emphasize the delicate checks and balances in man's abiotic and biotic environments and the stresses upon these ecosystems, which could affect the destiny of the world.
- Science is integrally related to mathematics.
- An effective science program builds students' ability to communicate accurately and precisely.
- An effective science program stresses both cooperative and independent learning.

SCI-TECH (SP): COURSE #452

Course Frequency: Full-year course, six times per six-day cycle
Credits Offered: Five
Prerequisites: Departmental Recommendation

Background to the Curriculum

Sci-tech is a project-based course integrating chemistry, physics, technology and engineering. It was first offered during the 1996-97 school year to meet the needs of SP level upper-class students not taking chemistry or physics. The hands-on nature of the curriculum and its support by special education make the course accessible to all students.

Core Topics/Concepts

Topic	*Concept*
Basic Chemistry – Water Testing and Water Quality	**Basic Chemistry** – Basic properties of matter – Atomic Structure – Acids and Bases
Motion/Forces/Energy – Simple Machines – Gravity cars – Collision – Construction Technology	**Motion/Forces/Energy** – Newton's laws describe and predict the motion of most objects. – Conservation of energy and momentum describe and predict an object's motion.
Heat/Thermodynamics – Solar Energy – Combustion Engines – Rockets	**Heat/Thermodynamics** – Heat energy is transferred between objects that are of different temperature.
Gases and Fluid Systems – Flight	**Gases and Fluid Systems** – Liquids and gasses allow force to be transferred from one location to another and have associated pressures and velocities.

Waves – Sound wave – Sound technology **Light** – Photography **Electrical Systems**	**Waves** – Waves carry energy from place to place without the transfer of matter. **Light** – Properties of light / electromagnetic spectrum **Electrical Systems** – The connection between current, voltage, and resistance – Components of circuits

Course-end Learning Objectives

Students will:

Basic Chemistry (Water Testing/Water Quality)

1] Identify and explain some physical properties used to measure matter.
2] Identify the major components of an atom.
3] Describe the four states of matter.
4] Explain how atoms combine to form compounds.
5] Identify some unique properties of water and their importance to life.
6] Understand the major chemical tests used to evaluate water quality.
7] Understand how benthic macro-invertebrates can be used to evaluate water quality.

Motion/Force/Energy

1] Explain the relationship between mass and motion.
2] Interpret and apply Newton's laws of motion.
3] Understand Newton's law of gravitation.
4] Understand the law of conservation of energy.
5] Describe the relationship between energy, work, and power.
6] Understand how energy can be transferred from kinetic to potential.
7] Demonstrate the steps in the design process.
8] Identify the stresses that affect structures.

Heat/Thermodynamics

1] Relate thermal energy to molecular motion.
2] Explain the relationship between temperature and heat.
3] Explain how to calculate the amount of heat energy transferred given a substance's temperature change, mass and specific heat.
4] Explain how environmental conditions influence heating and cooling of structures.
5] Explain how an internal combustion engine works.

Gases and Fluid Systems

1] Use the kinetic molecular theory to explain how pressure, volume and temperature relate.
2] Explain the Bernoulli principle.
3] Identify the forces involved in flight.

Waves (Sound)

1] Differentiate between wave motion and the motion of objects.
2] Recognize the measurable properties of waves.
3] Distinguish between mechanical and electromagnetic waves.
4] Explain the relationship between wave speed and the medium it traveled through.

Light

1] Describe the electromagnetic spectrum in terms of various wavelength and energy.
2] Explain how the various wavelengths in the spectrum are used.
3] Understand how a pinhole and a convex lens focus light.
4] Describe the chemical processes involved in photography

Electrical Systems

1] Understand current, voltage, resistance, and the connection between them.
2] Identify and explain the components of a circuit.

Assessment

- Tests: variety of styles including objective based (multiple choice, completion, matching), short essays, performance based, and oral tests
- Projects: Most of the topic activities involve something that is built and presented by the student.
- Class work and participation

Materials and Resources

Student Texts

Macaulay, David, The Way Things Work, (1988), Houghton Mifflin Company

Hewitt, Paul G., Conceptual Physics , 7th edition (1993), HarperCollins

Supplemental readings where applicable from various resources