

Florida Department of Education

COURSE DESCRIPTION - GRADES 9-12, ADULT

Subject Area: Science
Course Number: 2000430
Course Title: Biology Technology
Credit: 1.0

Will meet graduation requirement for Science

- A. Major Concepts/Content.** The purpose of this course is to provide exploratory experiences and laboratory and real-life applications in the biological sciences.

The content should include, but not be limited to, the following:

- the nature of science
- matter, energy, and chemical processes of life
- cells: biology, reproduction, and communication
- genetics: principles, molecular basis, diversity, and biotechnologies
- levels of organization, classification, and taxonomy
- structure, function, and reproduction of plants, animals, and microorganisms
- behavior of organisms
- interdependence of organisms, humans, and the environment
- biological selection, adaptations, and changes through time
- agricultural, food, and medical technologies and careers

This course shall integrate the Goal 3 Student Performance Standards of the Florida System of School Improvement and Accountability as appropriate to the content and processes of the subject matter.

- B. Special Note.** Laboratory investigations, which include the use of scientific research, measurement, laboratory technologies, and safety procedures, are an integral part of this course.

Students earning credit in Biology Technology may not earn credit in Fundamentals of Biology, Biology I, or Biology I Honors.

- C. Course Requirements.** These requirements include, but are not limited to, the benchmarks from the Sunshine State Standards that are most relevant to this course. Benchmarks correlated with a specific course requirement may also be addressed by other course requirements as appropriate.

Benchmarks from Science, Strand H, should not be taught and assessed in isolation, but should be combined with other benchmarks listed for this course.

After successfully completing this course, the student will:

- 1. Apply knowledge of the nature of science and scientific habits of mind to solve problems, and employ safe and effective use of laboratory technologies.**
 - SC.H.1.4.1 know that investigations are conducted to explore new phenomena, to check on previous results, to test how well a theory predicts, and to compare different theories.
 - SC.H.1.4.2 know that from time to time, major shifts occur in the scientific view of how the world works, but that more often, the changes that take place in the body of scientific knowledge are small modifications of prior knowledge.
 - SC.H.1.4.3 understand that no matter how well one theory fits observations, a new theory might fit them as well or better, or might fit a wider range of observations, because in science, the testing, revising, and occasional discarding of theories, new and old, never ends and leads to an increasingly better understanding of how things work in the world, but not to absolute truth.
 - SC.H.1.4.4 know that scientists in any one research group tend to see things alike and that therefore scientific teams are expected to seek out the possible sources of bias in the design of their investigations and in their data analysis.
 - SC.H.1.4.5 understand that new ideas in science are limited by the context in which they are conceived, are often rejected by the scientific establishment, sometimes spring from unexpected findings, and usually grow slowly from many contributors.
 - SC.H.1.4.6 understand that in the short run, new ideas that do not mesh well with mainstream ideas in science often encounter vigorous criticism and that in the long run, theories are judged by how they fit with other theories, the range of observations they explain, how well they explain observations, and how effective they are in predicting new findings.
 - SC.H.1.4.7 understand the importance of a sense of responsibility, a commitment to peer review, truthful reporting of the methods and outcomes of investigations, and making the public aware of the findings.
 - SC.H.2.4.1 know that scientists assume that the universe is a vast system in which basic rules exist that may range from very simple to extremely complex but that scientists operate on the belief that the rules can be discovered by careful, systemic study.

- SC.H.2.4.2 know that scientists control conditions in order to obtain evidence, but when that is not possible for practical or ethical reasons, they try to observe a wide range of natural occurrences to discern patterns.
 - SC.H.3.4.1 know that performance testing is often conducted using small-scale models, computer simulations, or analogous systems to reduce the chance of system failure.
 - SC.H.3.4.3 know that scientists can bring information, insights, and analytical skills to matters of public concern and help people understand the possible causes and effects of events.
 - SC.H.3.4.4 know that funds for science research come from federal government agencies, industry, and private foundations and that this funding often influences the areas of discovery.
- 2. Demonstrate understanding of the roles of matter, energy, and the chemical processes of life.**
- SC.B.1.4.1 understand how knowledge of energy is fundamental to all the scientific disciplines (e.g., the energy required for biological processes in living organisms and the energy required for the building, erosion, and rebuilding of the Earth).
 - SC.B.1.4.2 understand that there is conservation of mass and energy when matter is transformed.
 - SC.B.1.4.7 know that the total amount of usable energy always decreases, even though the total amount of energy is conserved in any transfer.
 - SC.F.1.4.1 know that the body processes involve specific biochemical reactions governed by biochemical principles.
 - SC.F.1.4.3 know that membranes are sites for chemical synthesis and essential energy conversions.
 - SC.F.1.4.4 understand that biological systems obey the same laws of conservation as physical systems.
 - SC.G.1.4.3 know that the chemical elements that make up the molecules of living things are combined and recombined in different ways.
- 3. Demonstrate understanding of the structure and processes of cells with emphasis on reproduction and communication.**
- SC.F.1.4.5 know that complex interactions among the different kinds of molecules in the cell cause distinct cycles of activity governed by proteins.
 - SC.F.1.4.8 know that cell behavior can be affected by molecules from other parts of the organism or even from other organisms.

SC.F.2.4.1 understand the mechanisms of asexual and sexual reproduction and know the different genetic advantages and disadvantages of asexual and sexual reproduction.

4. Demonstrate understanding of the principles of genetics with emphasis on the molecular basis of heredity, genetic diversity, and related biotechnologies.

SC.F.2.4.2 know that every cell contains a “blueprint” coded in DNA molecules that specify how proteins are assembled to regulate cells.

SC.G.2.4.3 understand how genetic variation of offspring contributes to population control in an environment and that natural selection ensures that those who are best adapted to their surroundings survive to reproduce.

5. Demonstrate understanding of the importance of levels of organization, classification, and taxonomy to the study of biology (e.g., ontogeny recapitulates phylogeny).

SC.G.1.4.1 know of the great diversity and interdependence of living things.

6. Demonstrate understanding of the relationships of structure, function, and reproduction of selected plants, animals, and microorganisms.

SC.F.1.4.2 know that body structures are uniquely designed and adapted for their function.

7. Demonstrate understanding of factors which affect the behavior of organisms.

SC.F.1.4.6 know that separate parts of the body communicate with each other using electrical and/or chemical signals.

SC.F.1.4.7 know that organisms respond to internal and external stimuli.

8. Demonstrate understanding of the interdependence of all living things and the environment.

SC.G.1.4.1 know of the great diversity and interdependence of living things.

SC.G.1.4.2 understand how the flow of energy through an ecosystem made up of producers, consumers, and decomposers carries out the processes of life and that some energy dissipates as heat and is not recycled.

- SC.G.1.4.3 know that the chemical elements that make up the molecules of living things are combined and recombined in different ways.
 - SC.G.2.4.1 know that layers of energy-rich organic materials have been gradually turned into great coal beds and oil pools (fossil fuels) by the pressure of the overlying earth and that humans burn fossil fuels to release the stored energy as heat and carbon dioxide.
 - SC.G.2.4.2 know that changes in a component of an ecosystem will have unpredictable effects on the entire system but that the components of the system tend to react in a way that will restore the ecosystem to its original condition.
 - SC.G.2.4.4 know that the world ecosystems are shaped by physical factors that limit their productivity.
 - SC.G.2.4.5 understand that the amount of life any environment can support is limited and that human activities can change the flow of energy and reduce the fertility of the Earth.
 - SC.G.2.4.6 know the ways in which humans today are placing their environmental support systems at risk (e.g., rapid human population growth, environmental degradation, and resource depletion).
- 9. Demonstrate understanding of types of selection, variations, and adaptations, and how they lead to biological changes through time.**
- SC.D.1.4.3 know that changes in Earth's climate, geological activity, and life forms may be traced and compared.
 - SC.D.1.4.4 know that Earth's systems and organisms are the result of a long, continuous change over time.
 - SC.F.2.4.3 understand the mechanisms of change (e.g., mutation and natural selection) that lead to adaptations in a species and their ability to survive naturally in changing conditions and to increase species diversity.
 - SC.G.1.4.1 know of the great diversity and interdependence of living things.
 - SC.G.2.4.3 understand how genetic variation of offspring contributes to population control in an environment and that natural selection ensures that those who are best adapted to their surroundings survive to reproduce.
- 10. Demonstrate understanding of the impact of agricultural, food, and medical technologies on the quality of our lives and career opportunities.**
- SC.D.2.4.1 understand the interconnectedness of the systems on Earth and the quality of life.

- SC.H.3.4.2 know that technological problems often create a demand for new scientific knowledge and that new technologies make it possible for scientists to extend their research in a way that advances science.
- SC.H.3.4.5 know that the value of a technology may differ for different people and at different times.
- SC.H.3.4.6 know that scientific knowledge is used by those who engage in design and technology to solve practical problems, taking human values and limitations into account.