Course No: G 700

Orange Unified School District

AGRICULTURE SCIENCE

(Formerly Introduction to Agriculture)
Year Course

GRADE LEVEL: 9-12

PREREQUISITES: Concurrent enrollment in Algebra.
(CTE; UC "G" approved)

INTRODUCTION TO THE SUBJECT:
Agriculture Science is offered to first year agriculture students who are interested in agriculture and possibly studying agriculture in a college or university. It has been designed to provide students with a unique perspective of agriculture and its impact on American society. It also provides students with critical thinking and leadership development skills via the Future Farmers of America (FFA), as well as foundation skills and knowledge in the seven program areas of agriculture.

The Agriculture Science course is designed to be both academically challenging and demanding. Students will be expected to not only acquire knowledge, but also to organize, analyze, evaluate, predict, problem solve, and apply this knowledge. The student must be able to read and comprehend a variety of materials, demonstrate writing skills that convey ideas in written and visual form, speak with clarity, meaning and confidence, exhibit creativity, use technology in research and accessing information, appreciate and respect individual and cultural differences, and demonstrate the ability to work collaboratively.

COURSE OBJECTIVES:

BY THE END OF THE COURSE THE STUDENT WILL BE ABLE TO:

Define agriculture and the agricultural industry.

Describe important needs and sources of food and fibers.

Explain ecosystems and their impact on agriculture.

Explain the importance of standard measurements in agriculture.

Explain important characteristics of biological organisms.

Explain life span and its stages.
Explain heredity and genetics in agriculture.

Define plant and distinguish plants from animals.

Explain sexual and asexual propagation in plants.

Explain and understand the major organ systems of animals.

Name and describe the major animal groups.

Explain the food nutrients needed by animals and plants.

Understand health concerns and diseases of animals.

Learn leadership skills associated with the FFA.

Develop a Supervised Agricultural Experience Project (SAEP).

Develop an understanding of data entry in record books.

List examples of plant and animal classifications.

COURSE OVERVIEW AND APPROXIMATE UNIT TIME ALLOTMENTS:

FIRST SEMESTER		**WEEKS**
I.	Meeting Human Needs in a Changing World	1
	1. Define agriculture and agribusiness	
	2. Describe how the agriculture industry meets human needs for food, fiber, and shelter	
	3. Identify the origin of food and fiber items	
	4. Describe areas of the agriculture industry that affects our quality of life	
	5. Contrast the interrelations of agriculture and society at the local, state, national, and international levels	
	6. Economic impact of leading agricultural commodities	
II.	Interpersonal Skills and Leadership Development (FFA)	2
	1. Examine leadership traits in a leader	
	2. Chart a short history and purposes of the FFA	
	3. List and describe the FFA degree requirements	
	4. Explain and recite the FFA Creed	
	5. List components of teamwork and cooperation	
	6. Goal setting and creating the positive attitude	
	7. Completion of a Supervised Agricultural Experience Project	

		WEEKS
III.	Parliamentary Procedure & Law	1
	1. Define Parliamentary procedure	
	2. Understand the basic concepts of Parliamentary law	
	3. Apply Parliamentary law in a meeting setting	
	4. Use effectively Parliamentary law within a meeting	
IV.	Communication and Speaking Skills	
	1. List and describe the importance of public speaking skills	
	2. Demonstrate the ability to lead a group discussion	
	3. Describe the importance of being a good listener	
	4. Demonstrate public speaking skills in selecting, researching, and orally delivering a 5-10 minute presentation	
VI.	Using Applied Sciences and Technology	1
	1. Explain how the areas of science relate to agriscience	
	2. Apply the scientific method	
	3. Examine the laws and regulations concerning biotechnology	
	4. Describe the role and uses of technology	
	5. Understand public concern for technological advancements in agriculture, such as Genetically Modified Organisms (GMO).	
VI.	Agriculture, the Environment and Earth's Resources	2
	1. Describe key agricultural environmental impacts on earth resources: soil, water, and air	
	2. Explain ecosystems and how they work	
	3. Understand current agricultural environmental challenges	
	4. Compare and contrast practices for conserving renewable/non-renewable resources.	
	5. Explain pollution and identify sources of pollution	
	6. Understand how new energy sources are developed from agricultural products	
VII.	Using the Science of Computation	2
	1. Define the important terms and concepts in agriscience measurements and computations	
	2. Explain the use and importance of standard measurement	
	3. Make measurements of length, temperature, and weights	
	4. Calculate area and volume of objects of various shapes	
VIII.	Determining the Bases of Life	2
	1. Understand the purpose and anatomy of cells	
	2. Describe how cell parts function	
	3. Explain and describe various cell functions	
	4. Describe the differences between plant and animal cells	

5. Describe the life processes in organisms

		WEEKS
IX.	Classifying and Naming Living Things	1
	1. Describe the classification system for living things	
	2. Explain taxonomy	
	3. Use a classification key to identify leaves	
	4. Describe how classification systems are useful in agriscience and technology	
X.	Applying Plant Science Principles	1
	1. Define plant science and how plants differ from animals	
	2. Label the parts of a plant and describe their functions	
	3. Explain the life cycle of a plant	
	4. Observe the effects of light on plant growth	
	5. Observe the effect of gravity on plant growth	
XI.	Plant Propagation and Reproduction	2
	1. Explain the processes for the propagation of plants	
	2. Label the parts of a plant and explain their functions	
	3. Determine viability of seeds by using germination and vigor tests	
	4. Explain the importance of imported seeds	
XII.	Plant Growth and Nutrients	2
	1. Explain factors and processes in plant growth	
	2. Understand the photosynthesis process and the roles of the sun, chlorophyll, sugar, carbon dioxide, and water in the process	
	3. Understand the anatomy and functions of plant systems and structures	
	4. Explain the respiration process in food and organic matter breakdown	
	5. Describe annual, biennial, and perennial life cycles	
	6. Examine plant sexual and asexual reproduction	
XIII.	Plant Insects and Pests	1
	1. Understand the major classifications of pests	
	2. Explain three conditions for pest problems	
	3. Describe how pests affect plants and cause losses	
	4. Examine the chemical, mechanical, cultural, and biological methods for plant pest control	
	5. Explain the advantages and disadvantages of Integrated Pest Management (IPM)	
	6. List safety practices to follow in pest control	
	Total Weeks 1st Semester:	18

SECOND SEMESTER

I.	Agriculture Science Research Project	2

1. Development of an agriculture science project

WEEKS

2. Statistical management of project via record book
3. Instructional coordination and supervision
4. Analysis of project results

II. Applying Animal Science Principles 2
1. Name and describe the major animal groups
2. Describe the anatomy and physiology of animals
3. Identify and explain the major organ systems of animals which include skeletal, nervous, circulatory, respiratory, excretory, digestive, reproductive, and mammary
4. Understand the evolution and roles of domesticated animals
5. Explain the differences between domestication and natural selection

III. Animal Feeds and Nutrition 2
1. Examine the feed needs of animals
2. Describe the feedstuffs that provide nutrients
3. Explain the characteristics of good feed
4. Understand animal feeding guidelines and evaluate sample feeding programs for various species
5. Describe the types of nutrients required by farm animals
6. Analyze suitable common feed ingredients for ruminant, monogastric, equine, and avian digestive systems, including roughages, concentrates, and supplements

IV. Animal Genetics and Reproduction 2
1. Differentiate between genotype and phenotype, and describe how dominant and recessive genes function
2. Compare and contrast genetic characteristics among different breeds of farm animals
3. Demonstrate how to display phenotype and genotype ratios by utilizing a Punnett Square
4. Explain the fertilization process and the methods of insemination
5. Understand the purpose and processes of mitosis and meiosis

V. Animal Health and Diseases 2
1. Explain common animal health practices
2. Understand the causes and control of common diseases
3. Describe environmental influences of animal health
4. List and examine the different types of animal diseases
5. Describe the different types of injections

VI. Using Biotechnology to Improve Life 2
1. Describe biotechnology and how it is being used
2. Identify issues associated with biotechnology

3. Distinguish between two major areas of biotechnology

WEEKS

4. List and explain examples of orgasmic biotechnology
5. Describe the role of genetics, cells, and genomes in molecular biotechnology
6. Describe the process of genetic engineering and the use of recombinant DNA
7. Identify the areas of agriscience being developed through genetic engineering

VII. Applying Principles of Soil Science — 2
1. Describe the major soil components and types
2. Explain the different ways that soil can be formed
3. Understand how soil texture, structure, pH, and salinity affect plant growth
4. Explain the different kinds of soil
5. Explain the types, uses, and applications of soil amendments and fertilizers
6. Explain the relation between soil and land

VIII. Marketing Technology in Agriscience — 2
1. Describe the importance of agricultural marketing
2. Explain ways agricultural products are marketed
3. List and explain the major functions in agricultural marketing
4. Describe the role of marketing infrastructure
5. Explain the role of communication in agricultural marketing

IX. Computer Technology and Agriculture — 1
1. Name five uses in agribusiness
2. Name and explain the functions of the major external parts of the computer
3. Demonstrate the use of a word processor
4. Gain access to the information highway through the Internet

X. Professional Opportunities in Agriculture — 1
1. Biotechnology and research fields
2. Other related agriculture science fields

Total Weeks 2nd Semester: 18

DATE OF LAST CONTENT REVISION: February 2001

DATE OF CURRENT CONTENT REVISION: April 2008

DATE OF BOARD APPROVAL: April 20, 2006

Addendum

THE CALIFORNIA CONTENT STANDARDS
LIFE SCIENCE
GRADES 10-12

CELL BIOLOGY

1. The fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism's cells. As a basis for understanding this concept:
    a. *Students know* cells are enclosed within semipermeable membranes that regulate their interaction with their surroundings.
    b. *Students know* enzymes are proteins that catalyze biochemical reactions without altering the reaction equilibrium and the activities of enzymes depend on the temperature, ionic conditions, and the pH of the surroundings.
    c. *Students know* how prokaryotic cells, eukaryotic cells (including those from plants and animals), and viruses differ in complexity and general structure.
    d. *Students know* the central dogma of molecular biology outlines the flow of information from transcription of ribonucleic acid (RNA) in the nucleus to translation of proteins on ribosomes in the cytoplasm.
    e. *Students know* the role of the endoplasmic reticulum and Golgi apparatus in the secretion of proteins.
    f. *Students know* usable energy is captured from sunlight by chloroplasts and is stored through the synthesis of sugar from carbon dioxide.
    g. *Students know* the role of the mitochondria in making stored chemical-bond energy available to cells by completing the breakdown of glucose to carbon dioxide.
    h. *Students know* most macromolecules (polysaccharides, nucleic acids, proteins, lipids) in cells and organisms are synthesized from a small collection of simple precursors.
    i. * *Students know* how chemiosmotic gradients in the mitochondria and chloroplast store energy for ATP production.
    j. * *Students know* how eukaryotic cells are given shape and internal organization by a cytoskeleton or cell wall or both.

GENETICS

2. Mutation and sexual reproduction lead to genetic variation in a population. As a basis for understanding this concept:
    a. *Students know* meiosis is an early step in sexual reproduction in which the pairs of chromosomes separate and segregate randomly during cell division to produce gametes containing one chromosome of each type.
    b. *Students know* only certain cells in a multicellular organism undergo meiosis.

c. *Students know* how random chromosome segregation explains the probability that a particular allele will be in a gamete.
d. *Students know* new combinations of alleles may be generated in a zygote through the fusion of male and female gametes (fertilization).
e. *Students know* why approximately half of an individual's DNA sequence comes from each parent.
f. *Students know* the role of chromosomes in determining an individual's sex.
g. *Students know* how to predict possible combinations of alleles in a zygote from the genetic makeup of the parents.

3. A multicellular organism develops from a single zygote, and its phenotype depends on its genotype, which is established at fertilization. As a basis for understanding this concept:
   a. *Students know* how to predict the probable outcome of phenotypes in a genetic cross from the genotypes of the parents and mode of inheritance (autosomal or X-linked, dominant or recessive).
   b. *Students know* the genetic basis for Mendel's laws of segregation and independent assortment.
   c. * *Students know* how to predict the probable mode of inheritance from a pedigree diagram showing phenotypes.
   d. * *Students know* how to use data on frequency of recombination at meiosis to estimate genetic distances between loci and to interpret genetic maps of chromosomes.

4. Genes are a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism. As a basis for understanding this concept:
   a. *Students know* the general pathway by which ribosomes synthesize proteins, using tRNAs to translate genetic information in mRNA.
   b. *Students know* how to apply the genetic coding rules to predict the sequence of amino acids from a sequence of codons in RNA.
   c. *Students know* how mutations in the DNA sequence of a gene may or may not affect the expression of the gene or the sequence of amino acids in an encoded protein.
   d. *Students know* specialization of cells in multicellular organisms is usually due to different patterns of gene expression rather than to differences of the genes themselves.
   e. *Students know* proteins can differ from one another in the number and sequence of amino acids.
   f. * *Students know* why proteins having different amino acid sequences typically have different shapes and chemical properties.

5. The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells. As a basis for understanding this concept:
   a. *Students know* the general structures and functions of DNA, RNA, and protein.

b. *Students know* how to apply base-pairing rules to explain precise copying of DNA during semiconservative replication and transcription of information from DNA into mRNA.
c. *Students know* how genetic engineering (biotechnology) is used to produce novel biomedical and agricultural products.
d. * *Students know* how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, ligation, and transformation) is used to construct recombinant DNA molecules.
e. * *Students know* how exogenous DNA can be inserted into bacterial cells to alter their genetic makeup and support expression of new protein products.

ECOLOGY

6. Stability in an ecosystem is a balance between competing effects. As a basis for understanding this concept:
   a. *Students know* biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats.
   b. *Students know* how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of nonnative species, or changes in population size.
   c. *Students know* how fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death.
   d. *Students know* how water, carbon, and nitrogen cycle between abiotic resources and organic matter in the ecosystem and how oxygen cycles through photosynthesis and respiration.
   e. *Students know* a vital part of an ecosystem is the stability of its producers and decomposers.
   f. *Students know* at each link in a food web some energy is stored in newly made structures but much energy is dissipated into the environment as heat. This dissipation may be represented in an energy pyramid.
   g. * *Students know* how to distinguish between the accommodation of an individual organism to its environment and the gradual adaptation of a lineage of organisms through genetic change.

EVOLUTION

7. The frequency of an allele in a gene pool of a population depends on many factors and may be stable or unstable over time. As a basis for understanding this concept:
   a. *Students know* why natural selection acts on the phenotype rather than the genotype of an organism.
   b. *Students know* why alleles that are lethal in a homozygous individual may be carried in a heterozygote and thus maintained in a gene pool.
   c. *Students know* new mutations are constantly being generated in a gene pool.
   d. *Students know* variation within a species increases the likelihood that at least some members of a species will survive under changed environmental conditions.
   e. * *Students know* the conditions for Hardy-Weinberg equilibrium in a population and why these conditions are not likely to appear in nature.

f. * *Students know* how to solve the Hardy-Weinberg equation to predict the frequency of genotypes in a population, given the frequency of phenotypes.

8. Evolution is the result of genetic changes that occur in constantly changing environments. As a basis for understanding this concept:
   a. *Students know* how natural selection determines the differential survival of groups of organisms.
   b. *Students know* a great diversity of species increases the chance that at least some organisms survive major changes in the environment.
   c. *Students know* the effects of genetic drift on the diversity of organisms in a population.
   d. *Students know* reproductive or geographic isolation affects speciation.
   e. *Students know* how to analyze fossil evidence with regard to biological diversity, episodic speciation, and mass extinction.
   f. * *Students know* how to use comparative embryology, DNA or protein sequence comparisons, and other independent sources of data to create a branching diagram (cladogram) that shows probable evolutionary relationships.
   g. * *Students know* how several independent molecular clocks, calibrated against each other and combined with evidence from the fossil record, can help to estimate how long ago various groups of organisms diverged evolutionarily from one another.

PHYSIOLOGY

9. As a result of the coordinated structures and functions of organ systems, the internal environment of the human body remains relatively stable (homeostatic) despite changes in the outside environment. As a basis for understanding this concept:
   a. *Students know* how the complementary activity of major body systems provides cells with oxygen and nutrients and removes toxic waste products such as carbon dioxide.
   b. *Students know* how the nervous system mediates communication between different parts of the body and the body's interactions with the environment.
   c. *Students know* how feedback loops in the nervous and endocrine systems regulate conditions in the body.
   d. *Students know* the functions of the nervous system and the role of neurons in transmitting electrochemical impulses.
   e. *Students know* the roles of sensory neurons, interneurons, and motor neurons in sensation, thought, and response.
   f. * *Students know* the individual functions and sites of secretion of digestive enzymes (amylases, proteases, nucleases, lipases), stomach acid, and bile salts.
   g. * *Students know* the homeostatic role of the kidneys in the removal of nitrogenous wastes and the role of the liver in blood detoxification and glucose balance.
   h. * *Students know* the cellular and molecular basis of muscle contraction, including the roles of actin, myosin, Ca^{+2} , and ATP.
   i. * *Students know* how hormones (including digestive, reproductive, osmoregulatory) provide internal feedback mechanisms for homeostasis at the cellular level and in whole organisms.

10. Organisms have a variety of mechanisms to combat disease. As a basis for understanding the human immune response:
    a. *Students know* the role of the skin in providing nonspecific defenses against infection.
    b. *Students know* the role of antibodies in the body's response to infection.
    c. *Students know* how vaccination protects an individual from infectious diseases.
    d. *Students know* there are important differences between bacteria and viruses with respect to their requirements for growth and replication, the body's primary defenses against bacterial and viral infections, and effective treatments of these infections.
    e. *Students know* why an individual with a compromised immune system (for example, a person with AIDS) may be unable to fight off and survive infections by microorganisms that are usually benign.
    f. * *Students know* the roles of phagocytes, B-lymphocytes, and T-lymphocytes in the immune system.