AGRICULTURAL SCIENCE AND TECHNOLOGY

Course Code 5624

Course Description:

The Agricultural Science and Technology course is designed to teach essential concepts and understanding related to plant and animal life including biotechnology, the conservation of natural resources, and the impact of agriculture and natural resource utilization on the environment. Emphasis is placed on the role of agriculture in our society and the importance of agriculture to the welfare of the world. Basic personal and community leadership and safety, and agricultural mechanical technology are included as a part of the instructional program. Each student is expected to design and participate in a supervised agricultural experience.

Typical learning activities include hands-on learning experiences including performing basic principles of plant, soil, and animal science; studying and modeling the significance of humankind's interrelationship with soil, water, and air; participating in FFA activities.

This course is a component of the following Agriculture, Food and Natural Resources Pathways:

- Agricultural Mechanics and Technology
- Environmental and Natural Resources Management
- Horticulture
- Plant and Animal Systems

OBJECTIVE:

Given the necessary equipment, supplies, and facilities, the student, upon completion of the prescribed number of instructional hours, will be able to successfully complete the following core competencies.

Credit: 1 unit

RECOMMENDED TEXTBOOK:

Agriscience Fundamentals and Applications – *Thomson Delmar*

ADDITIONAL RESOURCES:

Biological Science Applications in Agriculture Curriculum, Lesson Plan Library – *CAERT, Inc.*

UNIT A: AGRICULTURAL LITERACY IN AGRISCIENCE AND TECHNOLOGY

Lesson 1. Selecting an Agriculture Occupation

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Name and describe the major areas of agriculture occupations based on the nature of the work.
2. Name and describe the major areas of agriculture occupations based on level of employment.
3. Identify the factors to consider in selecting an occupation in agriculture.

Lesson 2. Understanding the Importance of Agriculture to Society

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Discuss modern agricultures role in basic human nutrition.
2. List agricultural products used to provide food.
3. Identify agricultural products used to provide clothing.
4. Identify agricultural products used to provide human shelter.

Lesson 3. Understanding Agriscience and Technology

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Explain the meaning of agriscience and technology.
2. Identify the major areas of agriscience
3. Explain the benefits of research in new areas of agriscience.

Lesson 4. Conducting Agricultural Research

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Define the research process and some practical applications in agriculture.
2. List and explain the five major steps in the scientific method.
3. Explain safety procedures that should be followed in the agriscience laboratory.

UNIT B: Developing Leadership Skills in Agriculture

Lesson 1. Exploring the History and Organization of FFA

Student Learning Objective: Instruction in this lesson should result in students achieving the following objectives:

1. Explain how, when, and why the FFA was organized.
2 Explain the mission and strategies, colors, motto, parts of the emblem, and the organizational structure of the FFA.
3. Recite and explain the meaning of the FFA Creed.
4. Explain the purpose of a Program of Activities and its committee structure.

Lesson 2. Discovering Opportunities in the FFA

Student Learning Objective: Instruction in this lesson should result in students achieving the following objectives:

1. Describe how the FFA develops leadership skills, personal growth, and career success.
2. Identify major state and national activities available to FFA members.

Lesson 3. Determining FFA Degrees, Awards, and CDEs

Student Learning Objective: Instruction in this lesson should result in students achieving the following objectives:

1. Explain the four FFA degree areas.
2. Identify the FFA proficiency awards.
3. Explain various team and individual Career Development Events.

Lesson 4. Understanding FFA Officer Duties and Responsibilities

Student Learning Objective: Instruction in this lesson should result in students achieving the following objectives:

1. Describe the duties and responsibilities of chapter FFA officers.
2. Explain the proper dress and characteristics of a good FFA leader.

UNIT C: SUPERVISED EXPERIENCE IN AGRICULTURE

Lesson 1. Determining the Benefits of an SAE

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Explain the importance of goals and career ladders.
2. Define supervised agricultural experience.
3. Explain the benefits of supervised agricultural experience programs.

Lesson 2. Determining the Kinds of SAE

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Explain the difference between entrepreneurship and placement SAE's..
2. Describe research and experimentation SAEs and exploratory SAE's.
3. Explain the characteristics of a good SAE program and student responsibilities.

Lesson 3. Researching Possible SAE Programs

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Identify career interest areas in agriculture.
2. Identify skills needed for career success.
3. Explain opportunities for SAE programs.

Lesson 4. Planning Your SAE Program

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Identify the steps in planning an SAE Program.
2. Identify the parts of an annual SAE program plan.
3. Discuss the function of a training plan and /or agreement in an SAE program

Lesson 5. Implementing SAE Programs

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Discuss the importance of keeping records on an SAE program.
2. Explain the types of financial records needed to support a chosen SAE program.
3. Identify standards to follow in keeping records on an SAE program.

UNIT D: Basic Soil Science Principles

Lesson 1. Determining the Nature of Soil

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Explain how the resources soil provides help in supporting life.
2. Explain the contents of soil.
3. Describe the biological nature of soil.
4. Describe the four ways plants use soil.
5. Describe some agricultural uses of soil.
6. Describe some nonagricultural uses of soil.

Lesson 2. Understanding Soil Texture and Structure

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Describe the concept of soil texture and its importance.
2. Determine the texture of a soil sample.
3. Describe soil structure, its formation, and importance.
4. Identify various soil structures.

Lesson 3. Explaining a Soil Profile

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Explain the soil profile.
2. Explain how soils within the profile change over time.
3. Distinguish between the major horizons of a soil profile.

Lesson 4. Understanding Moisture Holding Capacity

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Explain moisture holding capacity.
2. Explain what determines a soil's moisture holding capacity.
3. Determine the moisture holding capacity of a given soil profile.

Lesson 5. Understanding Soil Degradation

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Describe soil degradation.
2. Explain how construction can result in soil degradation.
3. Identify sources of contamination and explain how they result in soil degradation.
4. Explain soil erosion and how it results in soil degradation.
5. Identify other sources of soil degradation.

Lesson 6. Understanding Soil Erosion and Management Practices

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Explain soil erosion.
2. Identify the causes of soil erosion and steps in the erosion process.
3. Explain the ways in which different types of wind erosion occur and the associated problems.
4. Distinguish between the different types of water erosion.
5. Identify urban management practices that reduce soil erosion.
6. Identify agriculture management practices that will minimize soil erosion.

UNIT E Using Agriscience Tools and Equipment

Lesson 1. Practicing Safety in the Lab

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Explain the meaning of safety
2. List hazards found in agriscience laboratories
3. Identify and properly use personal protection equipment
4. Describe safety practices with machinery and tools
5. Describe safety in agriscience laboratories

Lesson 2. Identifying Agriscience Lab Tools

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

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1. Explain the importance of tools and equipment in agriscience.
2. Identify common agriscience equipment.
3. Describe important activities in maintaining agriscience equipment.

Lesson 3. Using the Microscope

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Explain the meaning and importance of microscopes in agriscience.
2. Identify the major parts of a microscope.
3. Demonstrate the proper use and care of a microscope.
4. Make a temporary wet-mount slide.

UNIT F Cells, Genetics, and Reproduction

Lesson 1. Exploring Cells

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Describe the cell's role as the structural unit.
2. Identify the various components of animal and plant cells and explain their functions.

Lesson 2. Exploring Genetics

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Describe how the gender of offspring is determined.
2. Explain how genotype and phenotype are different.
3. Distinguish between qualitative and quantitative inheritance

Lesson 3. Examining Mitosis and Meiosis

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Define mitosis and discuss its importance.
2. Explain each step of mitosis.
3. Define meiosis and explain its importance.
4. Explain each step of meiosis.

Lesson 4. Using Crossbreeding and Hybrids

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Discuss the importance of improved organisms to agriculture.
2. Identify methods used in agriscience to improve organisms.
3. Identify breeding systems used in animal science

UNIT G Basic Principles of Plant Science

Lesson 1. Classifying and Naming Plants

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Explain the importance of plants.
2. Explain the taxonomic classification of plants.
3. List characteristics that determine the classification of plants.
4. Describe how plants are named.
5. Explain reasons for using the scientific names of plants.

Lesson 2. Examining Plant Structures and Functions

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

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1. Describe the cellular structure of plants.
2. Identify the major parts of plants and explain their functions.
3. Distinguish between plants based on seed cotyledons.
4. Explain the absorption and transport systems of plants.

Lesson 3. Examining Flowers and Fruits

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Identify the major parts of flowers and explain the functions of the parts.
2. Describe the types of flowers.
3. Explain the processes of pollination and fertilization.
4. Describe the purposes and kinds of fruit.
5. Explain the structure and kinds of seed.

Lesson 4. Identifying Plant Types and Uses

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Describe plant science and its three major areas.
2. Identify common field crops and their uses.
3. Define horticultural crops and describe their uses.
4. Describe forestry and forest products.

Lesson 5. Determining the Importance of Photosynthesis and Respiration

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Explain photosynthesis and its importance.
2. Write the chemical equation for photosynthesis and explain it.
3. Explain how light and dark reactions differ.
4. Define respiration and explain why it is important.
5. List four factors that affect the rate of respiration.
6. Explain the importance of transpiration to plants.

Lesson 6. Managing Plant Pests

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Describe common pests and their major classifications.
2. Explain three conditions needed for pest problems.
3. Describe how pests affect plants and cause losses.
4. Explain Integrated Pest Management (IPM).
5. Describe methods used to control plant pests.

Lesson 7. Using Soils and Growing Media

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Identify the components of soil and soil less media.
2. Describe the differences between soil-based and soil less media.
3. Identify the elements involved in the formation of soil.
4. Describe the process of soil sterilization.

Lsson 8. Determining Plant Nutrients and Fertility

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Identify the essential nutrients for plant growth.
2. Distinguish between micronutrients and macronutrients.
3. Discuss the nitrogen cycle and its affect on plant nutrition.
4. Define pH and discuss its role in plant nutrition.
5. Explain the use of fertilizers.

Lesson 9. Propagating Plants Sexually

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Explain sexual reproduction of plants and its importance in plant survival.
2. Explain how pollination occurs and describe the different types of pollination.
3. Explain fertilization in flowering plants.
4. Explain the structures and formation of seeds.
5. Describe the conditions for seed germination.

Lesson 10. Propagating Plants Asexually

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Explain asexual propagation.
2. Discuss and identify the various methods of stem cutting propagation.
3. Discuss the methods of leaf and leaf-bud cuttings.
4. Describe the various types of growing media used for cuttings.
5. Describe grafting and identify three common methods.
6. Explain layering and the difference between separation and division in plant propagation.
7. Explain tissue culture.

UNIT H Basic Principles in Animal Science

Lesson 1. Identifying Differences between Plants and Animals

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

1. Explain the meaning of an organism and list its characteristics.
2. Define plant and animal.
3. Name and describe the life processes of living organisms.
4. List the similarities of plants and animals.
5. List and explain differences in the life processes of plants and animals.

Lesson 2. Determining the Anatomy and Physiology of Animals

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

: 1. Explain the meaning of anatomy and physiology.
2. Explain the role of cell specialization in organisms.
3. Describe the importance of anatomy and physiology in animal production.
4. List the organ systems of mammals and describe the functions, major parts and locations of each.
5. Identify the external parts of selected animals.

Lesson 3. Understanding Animal Reproduction

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

: 1. Describe the importance and process of animal reproduction.
2. List the sexual classification of animals for major species.
3. List the parts and explain the functions of female and male reproductive systems.
4. List and describe the phases of the estrous cycle
5. Explain the reproductive development of animals.

Lesson 4. Exploring the Animal Industry

STUDENT LEARNING OBJECTIVES. Instruction in this lesson should result in students achieving the following objectives:

: 1. Define the term animal industry and explain important areas of the industry.
2. Describe the uses of animals.
3. Explain animal domestication.
4. List and describe important areas in animal care and production.