Florida Department of Education
CLUSTER CURRICULUM FRAMEWORK

Cluster Title:	Agricultural Biotechnology Cluster
Cluster Type:	Job Preparatory
Occupational Area:	Agriculture and Natural Resources
Components:	Core, Three Programs, Three Completion Points
	Secondary
Grade Level	9-12 30, 31
Facility Code	203
CTSO	FFA
Coop Method	Yes

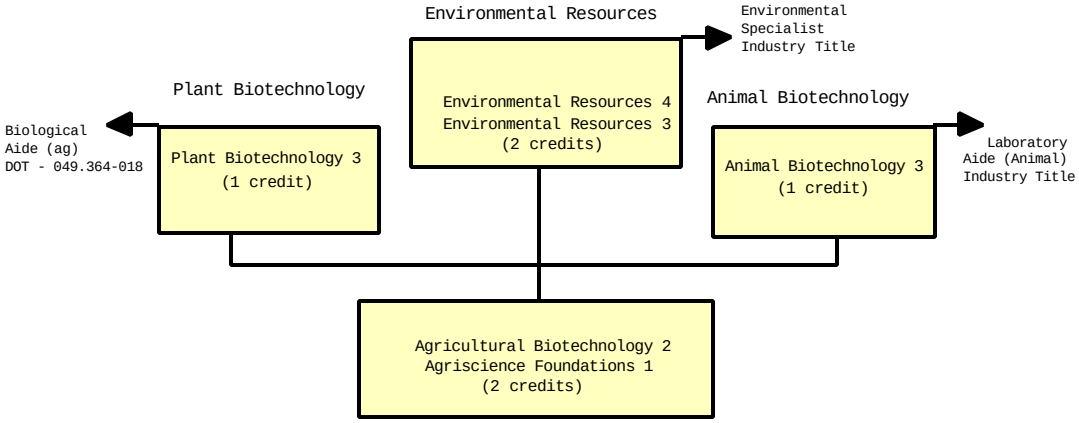
I. **PURPOSE:** The Agricultural Biotechnology cluster is designed to prepare students for employment or advanced training in the agricultural industry. This cluster focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the agricultural industry; planning, management, finance, technical and production skills, underlying principles of technology, labor issues, community issues and health, safety and environmental issues.

II. **CLUSTER STRUCTURE:** This cluster is a planned sequence of instruction consisting of a core, three programs and three completion points.

Students must complete the core courses, or demonstrate mastery of skills standards contained in these courses, before advancing in either of the programs.

The following diagram illustrates the **CLUSTER STRUCTURE**:

Agricultural Biotechnology Cluster



The programs in this cluster consist of the following courses:

ANIMAL BIOTECHNOLOGY

CORE
8106810 - Agriscience Foundations 1 - 1 secondary credit
8106850 - Agricultural Biotechnology 2 - 1 secondary credit

8106120 - Animal Biotechnology 3 - 1 secondary credit

ENVIRONMENTAL RESOURCES

CORE
8106810 - Agriscience Foundations 1 - 1 secondary credit
8106850 - Agricultural Biotechnology 2 - 1 secondary credit

8113010 - Environmental Resources 3 - 1 secondary credit
8113020 - Environmental Resources 4 - 1 secondary credit

PLANT BIOTECHNOLOGY

CORE
8106810 - Agriscience Foundations 1 - 1 secondary credit
8106850 - Agricultural Biotechnology 2 - 1 secondary credit

8106510 - Plant Biotechnology 3 - 1 secondary credit

III. **SPECIAL NOTE**: FFA (for secondary) is the appropriate Career Technical Student Organization for providing leadership training and for reinforcing specific vocational skills. Career Technical Student Organizations, when provided, shall be an integral part of the vocational instructional program, and the activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, FAC.

Classroom, laboratory and land laboratory activities are an integral part of this cluster, including the general maintenance and safe use of all instructional resources.

Planned and supervised instructional activities must be provided through one or more of the following: (1) directed laboratory experience, (2) student projects, (3) placement for experience, (4) cooperative experience.

Cooperative training - OJT is appropriate for this program. Whenever cooperative training - OJT is offered, the following are required for each student: a training plan, signed by the student, teacher, and employer, which includes instructional objectives and a list of on-the-job and in-school learning experiences; a workstation that reflects equipment, skills, and tasks that are relevant to the occupation which the student has chosen as a career goal. The student must receive compensation for work performed.

When a secondary student with a disability is enrolled in a vocational class with modifications to the curriculum framework, the particular outcomes and student performance standards, which the student must master to earn credit, must be specified on an individual basis. The job or jobs for which the student is being trained should be reflected in the student's desired post school outcome statement on the Transition Individual Educational Plan (Transition IEP).

SCANS Competencies: Instructional strategies for this program must include methods that require students to identify, organize, and use resources appropriately; to work with each other cooperatively and productively; to acquire and use information; to understand social, organizational, and technological systems; and to work with a variety of tools and equipment. Instructional strategies must also incorporate the methods to improve students' personal qualities and high-order thinking skills.

Equipment List: A generic equipment list is available for this program and is printed in a supplement to this document.

Florida Department of Education
INTENDED OUTCOMES

Program Title: ANIMAL BIOTECHNOLOGY

Secondary

Program Number	**8106100**
CIP Number	0102.020100
Grade Level	9-12 30, 31
Length	3 credits
Certification	VOC AGRI @4
	AGRICULTUR 1 @2
	AGRI @4

INTENDED OUTCOMES: After successfully completing this program the student will be able to:

OCCUPATIONAL COMPLETION POINT - DATA CODE A
Laboratory Aide (Animal) - Industry Title

01.0 Describe the socioeconomic role of the agricultural industry.
02.0 Apply scientific and technological principles to the agricultural industry.
03.0 Practice agricultural safety.
04.0 Demonstrate the use of tools, equipment and instruments in the agricultural industry.
05.0 Describe the principles of integrated pest management (IPM).
06.0 Describe the principles of plant and/or animal growth and reproduction.
07.0 Apply business skills and economic principles to the agricultural industry.
08.0 Explain the basic marketing processes in the agricultural industry.
09.0 Demonstrate human relations, communications, and leadership skills.
10.0 Describe biotechnology applications in the agricultural industry.
11.0 Conduct scientific investigation and apply results.
12.0 Demonstrate leadership, employability, communication and human relation skills.
13.0 Practice agricultural laboratory safety.
14.0 Demonstrate proper use of agricultural laboratory equipment and materials.
15.0 Describe the fundamentals of biotechnology.
16.0 Investigate the use of biotechnology in plant and/or animal science.
17.0 Apply genetic principles to animal science.
18.0 Interpret the relationship between TDN in feeds and its utilization.
19.0 Examine the developmental processes that determine animal growth.
20.0 Investigate the reproduction system of animals.
21.0 Describe animal science and the role of animals in society.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Program Title: Animal Biotechnology
Secondary Number: 8106100
Postsecondary Number:

OCCUPATIONAL COMPLETION POINT - DATA CODE A
Laboratory Aide (Animal) - Industry Title

01.0 DESCRIBE THE SOCIOECONOMIC ROLE OF THE AGRICULTURAL INDUSTRY--The student will be able to:

01.01 Prepare a report on the history of the agricultural industry.
01.02 Discuss the impact of agricultural products and services on the local, state, national, and global economy.
01.03 Investigate career opportunities in the agricultural industry and identify educational experiences necessary to prepare for those careers.
01.04 Discuss the role of the agricultural industry in the interaction of population, food, energy, and the environment.

02.0 APPLY SCIENTIFIC AND TECHNOLOGICAL PRINCIPLES TO THE AGRICULTURAL INDUSTRY--The student will be able to:

02.01 Discuss the importance of scientific classification in agriculture.
02.02 Use the scientific method to solve problems in agriculture.
02.03 Explain the use of genetics in agriculture, including probability applications.
02.04 Analyze the impact of recent technology on the agricultural industry.
02.05 Identify and describe the components of an ecosystem both biotic and abiotic.
02.06 Construct and analyze a diagram of a biological food web and subsequent food chains.
02.07 Describe and diagram the water, carbon, nitrogen, oxygen, sulfur, and phosphorus cycles.
02.08 Evaluate soil profiles, land-capability classes, and soil conservation practices.
02.09 List the components of Florida's fresh water systems (lakes, ground water, aquifer, sink holes, rivers, and swamps) and explain the importance of managing these resources.
02.10 Explain the interaction of one natural resource with another.
02.11 Describe the causes and effects of air, water, and land pollution and identify ways to prevent pollution.
02.12 Explain the flow of energy from the sun through agricultural systems.
02.13 Describe the environmental requirements necessary for a productive natural or man-made aquaculture system.
02.14 Apply principles of waste management to environmental problems common to agricultural systems.

02.15 Understand the concept of best management practices (BMP) as applied to agriculture.
02.16 Identify advances in biotechnology impacting agriculture such as transgenic crops and biological controls.
02.17 Identify computer technology advances such as Geographic Information Systems (GIS) and Global Positioning Systems (GPS).

03.0 PRACTICE AGRICULTURAL SAFETY--The student will be able to:

03.01 List the most common causes of agricultural accidents.
03.02 Discuss the importance of following proper safety precautions in the agricultural industry.
03.03 Demonstrate safety procedures in the classroom, laboratory, and workplace.
03.04 Describe symptoms of pesticide poisoning.
03.05 Extract pertinent information from a pesticide label and Material Safety Data Sheet (MSDS).
03.06 Select, mix, and apply a nonrestricted chemical, according to the label and according to Environmental Protection Agency (EPA), MSDS, and Worker Protection Standard regulations.
03.07 Clean and store pesticide application equipment, safety clothing, and safety equipment.
03.08 Identify the proper disposal of containers and residual pesticides.
03.09 Discuss the proper procedures of basic first aid and cardiopulmonary resuscitation (CPR).

04.0 DEMONSTRATE THE USE OF TOOLS, EQUIPMENT AND INSTRUMENTS IN THE AGRICULTURAL INDUSTRY--The student will be able to:

04.01 Choose the proper tools, equipment, and instruments for a specific job.
04.02 Describe the principles of selected mechanical applications (e.g. levers, pulleys, hydraulics, internal combustion).
04.03 Calibrate spray equipment; solve time, distance, area, volume ratio, proportion, and percentage problems in agriscience.
04.04 Demonstrate the ability to use an equipment manual.
04.05 Demonstrate the use of selected tools, equipment, and instruments.
04.06 Service, maintain, and store tools, equipment, instruments, and supplies.

05.0 DESCRIBE THE PRINCIPLES OF PEST MANAGEMENT --The student will be able to:

05.01 Identify types of pests and beneficials.
05.02 Identify and select an appropriate control for each type of pest and/or weed.
05.03 Describe the principles and benefits of integrated pest management.

06.0 DESCRIBE THE PRINCIPLES OF PLANT AND/OR ANIMAL NUTRIENT GROWTH AND REPRODUCTION--The student will be able to:

For plant:

06.01 Describe the structure functions of plant parts including roots, stems, leaves, and flowers.
06.02 Describe the processes of plant growth including photosynthesis, respiration and nutrient uptake.
06.03 Propagate plants through sexual and asexual means.
06.04 Identify the nutrients required for plant growth and development and the role of each.
06.05 Extract pertinent information from a fertilizer label.

For animal:

06.07 Identify the nutrients required for animal growth and development and the role of each.
06.08 Identify and describe the anatomical systems of animals and the functions of each, including major components.
06.09 Describe the process of animal reproduction.

07.0 APPLY BUSINESS SKILLS AND ECONOMIC PRINCIPLES TO THE AGRICULTURAL INDUSTRY--The student will be able to:

07.01 Explain the basic economic principles in the agricultural industry.
07.02 Explain the importance and impacts of local, state, and federal regulations and required documentation affecting the agricultural industry.
07.03 Describe the types of agribusiness by organizational structure (i.e. sole proprietorship, partnership, corporation, cooperatives).
07.04 Select and use computer applications.
07.05 Analyze and interpret agribusiness data.
07.06 Keep and maintain supervised agricultural experience (SAE) records.
07.07 Interpret legal descriptions of land.

08.0 EXPLAIN THE BASIC MARKETING PROCESSES IN THE AGRICULTURAL INDUSTRY--The student will be able to:

08.01 Describe key factors in marketing agricultural products.
08.02 Select agricultural products according to grades and standards.

09.0 DEMONSTRATE HUMAN-RELATIONS, COMMUNICATIONS, AND LEADERSHIP SKILLS--The student will be able to:

09.01 Demonstrate acceptable work habits and attitudes.
09.02 Correctly follow oral and written directions and ask questions that clarify directions, as needed.
09.03 Communicate effectively in verbal, written, and nonverbal modes.
09.04 Recognize and demonstrate good listening skills.
09.05 Conduct small informal and formal group meetings.

09.06 Identify the opportunities for leadership development available through an appropriate student and/or professional organization.
09.07 Recognize and demonstrate communications skills in the workplace.
09.08 Demonstrate effective telephone skills.

10.0 DESCRIBE BIOTECHNOLOGY APPLICATIONS IN THE AGRICULTURAL INDUSTRY--The student will be able to:

10.01 Explain how biotechnology has impacted the production of agricultural goods.
10.02 Describe the importance of biotechnology in providing an adequate supply of food and fiber.
10.03 Explain how biotechnology has affected careers in agriculture.
10.04 Suggest possible biotechnology solutions to current agricultural problems.

11.0 CONDUCT SCIENTIFIC INVESTIGATION AND APPLY RESULTS--The student will be able to:

11.01 Describe the major steps of scientific inquiry (the scientific method).
11.02 Design an agricultural experiment using appropriate control measures.
11.03 Devise a system for recording data.
11.04 Prepare a report on the experiment conducted.
11.05 Plan and conduct follow-up experiments using the scientific method.
11.06 Discuss research being conducted in agriculture.
11.07 Assess the risks and benefits of agricultural technology to society.
11.08 Summarize data and draw appropriate conclusions.
11.09 Collect and record data using SI units.

12.0 DEMONSTRATE LEADERSHIP, EMPLOYABILITY, COMMUNICATION AND HUMAN RELATION SKILLS--The student will be able to:

12.01 Conduct group meetings using parliamentary procedure and public speaking skills.
12.02 Follow acceptable work habits and personal characteristics.
12.03 Follow acceptable employee hygiene habits.
12.04 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons.
12.05 Conduct a job search and identify advanced training opportunities and the requirements.
12.06 Demonstrate an understanding of team planning, problem solving, and how communications processes and individuals contribute to the group.
12.07 Prepare a resume.
12.08 Work effectively as a team member.
12.09 Communicate well with others.
12.10 Present a written and an oral report.

13.0 PRACTICE AGRICULTURAL LABORATORY SAFETY--The student will be able to:

13.01 Identify first aid supplies, personnel and emergency protection areas.
13.02 Use appropriate safety procedures and guidelines.
13.03 Monitor, use, store and dispose of hazardous materials properly.
13.04 Understand and follow Material Safety Data Sheets (MSDS) and Occupational Safety and Health Administration (OSHA) standards.
13.05 Understand and utilize safety equipment.
13.06 Identify safety symbols and signs.

14.0 DEMONSTRATE PROPER USE OF AGRICULTURAL LABORATORY EQUIPMENT AND MATERIALS--The student will be able to:

14.01 Practice aseptic techniques.
14.02 Perform mathematical calculations and conversions.
14.03 Make stock reagents and solutions.
14.04 Monitor physical properties of a solution.
14.05 Sterilize and prepare equipment.
14.06 Make and dispense media.
14.07 Maintain reagent integrity.
14.08 Maintain inventory of laboratory supplies.
14.09 Use basic weighing and measuring techniques.
14.10 Perform basic separation techniques.
14.11 Handle and store biological materials.
14.12 Use specialized equipment in the laboratory.

15.0 DESCRIBE THE FUNDAMENTALS OF BIOTECHNOLOGY--The student will be able to:

15.01 Describe the cell as the basic unit of life.
15.02 Describe the importance of single-celled organisms to agriculture.
15.03 Explain how the knowledge of cells is important to agriculture.
15.04 Analyze the difference between plant cells and animal cells.
15.05 Explain the variations in different types of cells.
15.06 Describe cellular structure.
15.07 Give examples of agricultural uses of cellular structures.
15.08 Analyze the functions of various parts of cells.
15.09 Explain the Mendel Theory of Genetics.
15.10 Analyze a Punnett Square.
15.11 Discuss the make-up of chromosomes.
15.12 Discuss the process of DNA transfer.
15.13 Describe the relationship of cellular science and biotechnology.

16.0 INVESTIGATE THE USE OF BIOTECHNOLOGY IN PLANT AND/OR ANIMAL SCIENCE--The student will be able to:

For plant:

16.01 Explain how the inheritance of traits in plants is regulated.
16.02 Apply basic principles of plant genetics.
16.03 Describe the process of pollination in plants.

16.04 Explain how biotechnology is being used in combination with conventional plant-breeding programs.
16.05 Determine the effects of moisture, temperature, oxygen, and light on seed germination.
16.06 Explain the major steps in the seed germination process.
16.07 Describe the role of enzymes and hormones in seed germination.
16.08 Explain the major steps in the seed germination process.
16.09 Apply basic micropropagation techniques.
16.10 Describe and examine the effects of plant growth regulators.
16.11 Describe the factors that affect nutrient levels contained in plant tissues.
16.12 Describe nutrient uptake and translocation processes.
16.13 Compare plant nutrient levels by stage growth.
16.14 Describe how herbicides work within plants to cause injury or death.
16.15 Explain the differential effects of herbicides.
16.16 Determine the influence of climatic conditions, plant characteristics, and application techniques on herbicide effectiveness.

For animal:

16.17 Discuss the interdependence of systems in an animal's body.
16.18 Specify how genetic principles are used in animal breeding.
16.19 Explain how crossbred animals are developed.
16.20 Explain the steps involved in meiosis.
16.21 Explain the process of natural fertilization.
16.22 Explain alternate reproductive technologies.
16.23 Research career opportunities in animal science.
16.24 Analyze the factors influencing animal growth.
16.25 Explain the stages of animal growth.
16.26 Identify the prevalent diseases and parasites and their biological impact on animals.
16.27 Describe the proper methods of prevention and treatment of diseases and parasites that affect animals.
16.28 Research environmental issues affecting animal science.

17.0 APPLY GENETIC PRINCIPLES TO ANIMAL SCIENCE--The student will be able to:

17.01 Describe how the concept of heritability is used in the selection of livestock.
17.02 Chart the difference between phenotypic and genotypic characteristics and determine probabilities.
17.03 Analyze performance data used in the selection process of livestock.
17.04 Use computer data to assist in the selection process of livestock.
17.05 Differentiate between dominant and recessive traits.
17.06 Describe the chemical and physical properties of DNA.
17.07 Extract a visible mass of DNA from animal or plant tissue.
17.08 Develop a hypothetical species using genetic engineering.
17.09 Debate the safeguards used in research in genetic engineering.

18.0 INTERPRET THE RELATIONSHIP BETWEEN TDN IN FEEDS AND ITS UTILIZATION--The student will be able to:

18.01 Determine nutritional requirements of selected animals.
18.02 Select appropriate feed samples for analysis of nutritional values and develop a balanced ration.
18.03 Conduct experiments comparing growth rates using selected rations.
18.04 Obtain information from a feed label and determine which nutrients are derived from which component.
18.05 Demonstrate the effects digestive agents have in the digestive process.
18.06 Compare how the body's cells metabolize fats, carbohydrates and proteins.
18.07 Analyze the effect of diseases on nutritional utilization.

19.0 EXAMINE THE DEVELOPMENTAL PROCESSES THAT DETERMINE ANIMAL GROWTH--The student will be able to:

19.01 Develop a growth curve using selected animal species.
19.02 Differentiate between muscle, fat, and bone development.
19.03 Evaluate the effects of hormones in animal production.
19.04 Compare morphology of developing embryos.
19.05 Analyze the diseases that effect development growth.

20.0 INVESTIGATE THE REPRODUCTION SYSTEM OF ANIMALS--The student will be able to:

20.01 Analyze the quality of semen of selected animals.
20.02 Compare and contrast sperm anatomy of selected animal species.
20.03 Analyze the factors that affect sperm mobility and development.
20.04 Compare and contrast the reproductive cycles of selected animal species.
20.05 Compare and contract the breeding time and conception rates of selected animal species.
20.06 Describe the functions of hormones that control reproduction.
20.07 Discuss the use of hormone therapy to manipulate ovarian activity.
20.08 Describe and compare the different pathogens that cause animal diseases.
20.09 Analyze the mating process of selected animal species.

21.0 DESCRIBE ANIMAL SCIENCE AND THE ROLE OF ANIMALS IN SOCIETY--The student will be able to:

21.01 Differentiate between animal welfare and animal rights.
21.02 Debate current events concerning animal welfare and animal rights.
21.03 Demonstrate safe procedures when working with animal related equipment in laboratory settings.
21.04 Practice safety precautions around animals.
21.05 Develop a research project related to biotechnology and animal science.

21.06 Discuss the benefits of biotechnology in producing and marketing animals and animal products.
21.07 Research how biotechnology affects the consumer.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Course Number: 8106810
Course Title: Agriscience Foundations I
Course Credit: 1

COURSE DESCRIPTION:

This course was developed as a core and is designed to develop competencies in the areas of agricultural history; global importance of agriculture; career opportunities; applied scientific and technological concepts; ecosystems; agricultural safety; principles of integrated pest management; principles of plant and animal growth; economic principles; agricultural marketing; and human relations skills.

01.0 DESCRIBE THE SOCIOECONOMIC ROLE OF THE AGRICULTURAL INDUSTRY--The student will be able to:

- 01.01 Prepare a report on the history of the agricultural industry.
- 01.02 Discuss the impact of agricultural products and services on the local, state, national, and global economy.
- 01.03 Investigate career opportunities in the agricultural industry and identify educational experiences necessary to prepare for those careers.
- 01.04 Discuss the role of the agricultural industry in the interaction of population, food, energy, and the environment.

02.0 APPLY SCIENTIFIC AND TECHNOLOGICAL PRINCIPLES TO THE AGRICULTURAL INDUSTRY--The student will be able to:

- 02.01 Discuss the importance of scientific classification in agriculture.
- 02.02 Use the scientific method to solve problems in agriculture.
- 02.03 Explain the use of genetics in agriculture, including probability applications.
- 02.04 Analyze the impact of recent technology on the agricultural industry.
- 02.05 Identify and describe the components of an ecosystem both biotic and abiotic.
- 02.06 Construct and analyze a diagram of a biological food web and subsequent food chains.
- 02.07 Describe and diagram the water, carbon, nitrogen, oxygen, sulfur, and phosphorus cycles.
- 02.08 Evaluate soil profiles, land-capability classes, and soil conservation practices.
- 02.09 List the components of Florida's fresh water systems (lakes, ground water, aquifer, sink holes, rivers, and swamps) and explain the importance of managing these resources.
- 02.10 Explain the interaction of one natural resource with another.
- 02.11 Describe the causes and effects of air, water, and land pollution and identify ways to prevent pollution.

02.12 Explain the flow of energy from the sun through agricultural systems.
02.13 Describe the environmental requirements necessary for a productive natural or man-made aquaculture system.
02.14 Apply principles of waste management to environmental problems common to agricultural systems.
02.15 Understand the concept of best management practices (BMP) as applied to agriculture.
02.16 Identify advances in biotechnology impacting agriculture such as transgenic crops and biological controls.
02.17 Identify computer technology advances such as Geographic Information Systems (GIS) and Global Positioning Systems (GPS).

03.0 PRACTICE AGRICULTURAL SAFETY--The student will be able to:

03.01 List the most common causes of agricultural accidents.
03.02 Discuss the importance of following proper safety precautions in the agricultural industry.
03.03 Demonstrate safety procedures in the classroom, laboratory, and workplace.
03.04 Describe symptoms of pesticide poisoning.
03.05 Extract pertinent information from a pesticide label and Material Safety Data Sheet (MSDS).
03.06 Select, mix, and apply a nonrestricted chemical, according to the label and according to Environmental Protection Agency (EPA), MSDS, and Worker Protection Standard regulations.
03.07 Clean and store pesticide application equipment, safety clothing, and safety equipment.
03.08 Identify the proper disposal of containers and residual pesticides.
03.09 Discuss the proper procedures of basic first aid and cardiopulmonary resuscitation (CPR).

04.0 DEMONSTRATE THE USE OF TOOLS, EQUIPMENT AND INSTRUMENTS IN THE AGRICULTURAL INDUSTRY--The student will be able to:

04.01 Choose the proper tools, equipment, and instruments for a specific job.
04.02 Describe the principles of selected mechanical applications (e.g. levers, pulleys, hydraulics, internal combustion).
04.03 Calibrate spray equipment; solve time, distance, area, volume ratio, proportion, and percentage problems in agriscience.
04.04 Demonstrate the ability to use an equipment manual.
04.05 Demonstrate the use of selected tools, equipment, and instruments.
04.06 Service, maintain, and store tools, equipment, instruments, and supplies.

05.0 DESCRIBE THE PRINCIPLES OF PEST MANAGEMENT --The student will be able to:

05.01 Identify types of pests and beneficials.
05.02 Identify and select an appropriate control for each type of pest and/or weed.
05.03 Describe the principles and benefits of integrated pest management.

06.0 DESCRIBE THE PRINCIPLES OF PLANT AND/OR ANIMAL NUTRIENT GROWTH AND REPRODUCTION--The student will be able to:

For plant:

06.01 Describe the structure functions of plant parts including roots, stems, leaves, and flowers.
06.02 Describe the processes of plant growth including photosynthesis, respiration and nutrient uptake.
06.03 Propagate plants through sexual and asexual means.
06.04 Identify the nutrients required for plant growth and development and the role of each.
06.05 Extract pertinent information from a fertilizer label.

For animal:

06.07 Identify the nutrients required for animal growth and development and the role of each.
06.08 Identify and describe the anatomical systems of animals and the functions of each, including major components.
06.09 Describe the process of animal reproduction.

07.0 APPLY BUSINESS SKILLS AND ECONOMIC PRINCIPLES TO THE AGRICULTURAL INDUSTRY--The student will be able to:

07.01 Explain the basic economic principles in the agricultural industry.
07.02 Explain the importance and impacts of local, state, and federal regulations and required documentation affecting the agricultural industry.
07.03 Describe the types of agribusiness by organizational structure (i.e. sole proprietorship, partnership, corporation, cooperatives).
07.04 Select and use computer applications.
07.05 Analyze and interpret agribusiness data.
07.06 Keep and maintain supervised agricultural experience (SAE) records.
07.07 Interpret legal descriptions of land.

08.0 EXPLAIN THE BASIC MARKETING PROCESSES IN THE AGRICULTURAL INDUSTRY--The student will be able to:

08.01 Describe key factors in marketing agricultural products.
08.02 Select agricultural products according to grades and standards.

09.0 DEMONSTRATE HUMAN-RELATIONS, COMMUNICATIONS, AND LEADERSHIP SKILLS--The student will be able to:

09.01 Demonstrate acceptable work habits and attitudes.
09.02 Correctly follow oral and written directions and ask questions that clarify directions, as needed.
09.03 Communicate effectively in verbal, written, and nonverbal modes.
09.04 Recognize and demonstrate good listening skills.

09.05 Conduct small informal and formal group meetings.
09.06 Identify the opportunities for leadership development available through an appropriate student and/or professional organization.
09.07 Recognize and demonstrate communications skills in the workplace.
09.08 Demonstrate effective telephone skills.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Course Number: 8106850
Course Title: Agricultural Biotechnology 2
Course Credit: 1

COURSE DESCRIPTION:

This course was developed as a core and is designed to develop competencies in the areas of agricultural biotechnology in agriculture, scientific investigation, laboratory safety, scientific and technological concepts; and the fundamentals of biotechnology.

10.0 DESCRIBE BIOTECHNOLOGY APPLICATIONS IN THE AGRICULTURAL INDUSTRY--The student will be able to:

- 10.01 Explain how biotechnology has impacted the production of agricultural goods.
- 10.02 Describe the importance of biotechnology in providing an adequate supply of food and fiber.
- 10.03 Explain how biotechnology has affected careers in agriculture.
- 10.04 Suggest possible biotechnology solutions to current agricultural problems.

11.0 CONDUCT SCIENTIFIC INVESTIGATION AND APPLY RESULTS--The student will be able to:

- 11.01 Describe the major steps of scientific inquiry (the scientific method).
- 11.02 Design an agricultural experiment using appropriate control measures.
- 11.03 Devise a system for recording data.
- 11.04 Prepare a report on the experiment conducted.
- 11.05 Plan and conduct follow-up experiments using the scientific method.
- 11.06 Discuss research being conducted in agriculture.
- 11.07 Assess the risks and benefits of agricultural technology to society.
- 11.08 Summarize data and draw appropriate conclusions.
- 11.09 Collect and record data using SI units.

12.0 DEMONSTRATE LEADERSHIP, EMPLOYABILITY, COMMUNICATION AND HUMAN RELATION SKILLS--The student will be able to:

- 12.01 Conduct group meetings using parliamentary procedure and public speaking skills.
- 12.02 Follow acceptable work habits and personal characteristics.
- 12.03 Follow acceptable employee hygiene habits.
- 12.04 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons.

12.05 Conduct a job search and identify advanced training opportunities and the requirements.
12.06 Demonstrate an understanding of team planning, problem solving, and how communications processes and individuals contribute to the group.
12.07 Prepare a resume.
12.08 Work effectively as a team member.
12.09 Communicate well with others.
12.10 Present a written and an oral report.

13.0 PRACTICE AGRICULTURAL LABORATORY SAFETY--The student will be able to:

13.01 Identify first aid supplies, personnel and emergency protection areas.
13.02 Use appropriate safety procedures and guidelines.
13.03 Monitor, use, store and dispose of hazardous materials properly.
13.04 Understand and follow Material Safety Data Sheets (MSDS) and Occupational Safety and Health Administration (OSHA) standards.
13.05 Understand and utilize safety equipment.
13.06 Identify safety symbols and signs.

14.0 DEMONSTRATE PROPER USE OF AGRICULTURAL LABORATORY EQUIPMENT AND MATERIALS--The student will be able to:

14.01 Practice aseptic techniques.
14.02 Perform mathematical calculations and conversions.
14.03 Make stock reagents and solutions.
14.04 Monitor physical properties of a solution.
14.05 Sterilize and prepare equipment.
14.06 Make and dispense media.
14.07 Maintain reagent integrity.
14.08 Maintain inventory of laboratory supplies.
14.09 Use basic weighing and measuring techniques.
14.10 Perform basic separation techniques.
14.11 Handle and store biological materials.
14.12 Use specialized equipment in the laboratory.

15.0 DESCRIBE THE FUNDAMENTALS OF BIOTECHNOLOGY--The student will be able to:

15.01 Describe the cell as the basic unit of life.
15.02 Describe the importance of single-celled organisms to agriculture.
15.03 Explain how the knowledge of cells is important to agriculture.
15.04 Analyze the difference between plant cells and animal cells.
15.05 Explain the variations in different types of cells.
15.06 Describe cellular structure.
15.07 Give examples of agricultural uses of cellular structures.
15.08 Analyze the functions of various parts of cells.
15.09 Explain the Mendel Theory of Genetics.
15.10 Analyze a Punnett Square.
15.11 Discuss the make-up of chromosomes.
15.12 Discuss the process of DNA transfer.

15.13 Describe the relationship of cellular science and biotechnology.

16.0 INVESTIGATE THE USE OF BIOTECHNOLOGY IN PLANT AND/OR ANIMAL SCIENCE--The student will be able to:

For plant:

16.01 Explain how the inheritance of traits in plants is regulated.
16.02 Apply basic principles of plant genetics.
16.03 Describe the process of pollination in plants.
16.04 Explain how biotechnology is being used in combination with conventional plant-breeding programs.
16.05 Determine the effects of moisture, temperature, oxygen, and light on seed germination.
16.06 Explain the major steps in the seed germination process.
16.07 Describe the role of enzymes and hormones in seed germination.
16.08 Explain the major steps in the seed germination process.
16.09 Apply basic micropropagation techniques.
16.10 Describe and examine the effects of plant growth regulators.
16.11 Describe the factors that affect nutrient levels contained in plant tissues.
16.12 Describe nutrient uptake and translocation processes.
16.13 Compare plant nutrient levels by stage growth.
16.14 Describe how herbicides work within plants to cause injury or death.
16.15 Explain the differential effects of herbicides.
16.16 Determine the influence of climatic conditions, plant characteristics, and application techniques on herbicide effectiveness.

For animal:

16.17 Discuss the interdependence of systems in an animal’s body.
16.18 Specify how genetic principles are used in animal breeding.
16.19 Explain how crossbred animals are developed.
16.20 Explain the steps involved in meiosis.
16.21 Explain the process of natural fertilization.
16.22 Explain alternate reproductive technologies.
16.23 Research career opportunities in animal science.
16.24 Analyze the factors influencing animal growth.
16.25 Explain the stages of animal growth.
16.26 Identify the prevalent diseases and parasites and their biological impact on animals.
16.27 Describe the proper methods of prevention and treatment of diseases and parasites that affect animals.
16.28 Research environmental issues affecting animal science.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Course Number: 8106120
Course Title: Animal Biotechnology 3
Course Credit: 1

COURSE DESCRIPTION:

This course is designed to develop competencies in the areas of biotechnology in animal science, animal growth and reproduction, and the role of animals in society.

17.0 APPLY GENETIC PRINCIPLES TO ANIMAL SCIENCE--The student will be able to:

- 17.01 Describe how the concept of heritability is used in the selection of livestock.
- 17.02 Chart the difference between phenotypic and genotypic characteristics and determine probabilities.
- 17.03 Analyze performance data used in the selection process of livestock.
- 17.04 Use computer data to assist in the selection process of livestock.
- 17.05 Differentiate between dominant and recessive traits.
- 17.06 Describe the chemical and physical properties of DNA.
- 17.07 Extract a visible mass of DNA from animal or plant tissue.
- 17.08 Develop a hypothetical species using genetic engineering.
- 17.09 Debate the safeguards used in research in genetic engineering.

18.0 INTERPRET THE RELATIONSHIP BETWEEN TDN IN FEEDS AND ITS UTILIZATION--The student will be able to:

- 18.01 Determine nutritional requirements of selected animals.
- 18.02 Select appropriate feed samples for analysis of nutritional values and develop a balanced ration.
- 18.03 Conduct experiments comparing growth rates using selected rations.
- 18.04 Obtain information from a feed label and determine which nutrients are derived from which component.
- 18.05 Demonstrate the effects digestive agents have in the digestive process.
- 18.06 Compare how the body’s cells metabolize fats, carbohydrates and proteins.
- 18.07 Analyze the effect of diseases on nutritional utilization.

19.0 EXAMINE THE DEVELOPMENTAL PROCESSES THAT DETERMINE ANIMAL GROWTH--The student will be able to:

- 19.01 Develop a growth curve using selected animal species.
- 19.02 Differentiate between muscle, fat, and bone development.
- 19.03 Evaluate the effects of hormones in animal production.
- 19.04 Compare morphology of developing embryos.

19.05 Analyze the diseases that effect development growth.

20.0 INVESTIGATE THE REPRODUCTION SYSTEM OF ANIMALS--The student will be able to:

20.01 Analyze the quality of semen of selected animals.
20.02 Compare and contract sperm anatomy of selected animal species.
20.03 Analyze the factors that affect sperm mobility and development.
20.04 Compare and contrast the reproductive cycles of selected animal species.
20.05 Compare and contrast the breeding time and conception rates of selected animal species.
20.06 Describe the functions of hormones that control reproduction.
20.07 Discuss the use of hormone therapy to manipulate ovarian activity.
20.08 Describe and compare the different pathogens that cause animal diseases.
20.09 Analyze the mating process of selected animal species.

21.0 DESCRIBE ANIMAL SCIENCE AND THE ROLE OF ANIMALS IN SOCIETY--The student will be able to:

21.01 Differentiate between animal welfare and animal rights.
21.02 Debate current events concerning animal welfare and animal rights.
21.03 Demonstrate safe procedures when working with animal related equipment in laboratory settings.
21.04 Practice safety precautions around animals.
21.05 Develop a research project related to biotechnology and animal science.
21.06 Discuss the benefits of biotechnology in producing and marketing animals and animal products.
21.07 Research how biotechnology affects the consumer.

Florida Department of Education
INTENDED OUTCOMES

Program Title: ENVIRONMENTAL RESOURCES

Secondary

Program Number	**8113000**
CIP Number	0103.010101
Grade Level	9-12 30, 31
Length	4 credits
Certification	VOC AGRI @4
	AGRICULTUR 1 @2
	AGRI @4

INTENDED OUTCOMES: After successfully completing this program the student will be able to:

OCCUPATIONAL COMPLETION POINT - DATA CODE A
Environmental Specialist - Industry Title

01.0 Describe the socioeconomic role of the agricultural industry.
02.0 Apply scientific and technological principles to the agricultural industry.
03.0 Practice agricultural safety.
04.0 Demonstrate the use of tools, equipment and instruments in the agricultural industry.
05.0 Describe the principles of integrated pest management (IPM).
06.0 Describe the principles of plant and/or animal growth and reproduction.
07.0 Apply business skills and economic principles to the agricultural industry.
08.0 Explain the basic marketing processes in the agricultural industry.
09.0 Demonstrate human relations, communications, and leadership skills.
10.0 Describe biotechnology applications in the agricultural industry.
11.0 Conduct scientific investigation and apply results.
12.0 Demonstrate leadership, employability, communication and human relation skills.
13.0 Practice agricultural laboratory safety.
14.0 Demonstrate proper use of agricultural laboratory equipment and materials.
15.0 Describe the fundamentals of biotechnology.
16.0 Investigate the use of biotechnology in plant and/or animal science.
17.0 Collect and test samples used to determine soil characteristics.
18.0 Determine the quality and quantity of water resources.
19.0 Identify, classify and preserve samples and specimens of native flora and fauna.
20.0 Identify major ecosystems in Florida.
21.0 Collect, record and analyze data.
22.0 Demonstrate orienteering and map reading skills.
23.0 Research environmental issues.
24.0 Understand the management of lands.
25.0 Investigate the application of weather systems in the agricultural industry.

26.0 Describe game and non-game wildlife programs in Florida.
27.0 Identify commodity and non-commodity resources.
28.0 Practice sustainable agriculture.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Program Title: Environmental Resources
Secondary Number: 8113000
Postsecondary Number:

OCCUPATIONAL COMPLETION POINT - DATA CODE A
Environmental Specialist - Industry Title

01.0 DESCRIBE THE SOCIOECONOMIC ROLE OF THE AGRICULTURAL INDUSTRY--The student will be able to:

01.01 Prepare a report on the history of the agricultural industry.
01.02 Discuss the impact of agricultural products and services on the local, state, national, and global economy.
01.03 Investigate career opportunities in the agricultural industry and identify educational experiences necessary to prepare for those careers.
01.04 Discuss the role of the agricultural industry in the interaction of population, food, energy, and the environment.

02.0 APPLY SCIENTIFIC AND TECHNOLOGICAL PRINCIPLES TO THE AGRICULTURAL INDUSTRY--The student will be able to:

02.01 Discuss the importance of scientific classification in agriculture.
02.02 Use the scientific method to solve problems in agriculture.
02.03 Explain the use of genetics in agriculture, including probability applications.
02.04 Analyze the impact of recent technology on the agricultural industry.
02.05 Identify and describe the components of an ecosystem both biotic and abiotic.
02.06 Construct and analyze a diagram of a biological food web and subsequent food chains.
02.07 Describe and diagram the water, carbon, nitrogen, oxygen, sulfur, and phosphorus cycles.
02.08 Evaluate soil profiles, land-capability classes, and soil conservation practices.
02.09 List the components of Florida's fresh water systems (lakes, ground water, aquifer, sink holes, rivers, and swamps) and explain the importance of managing these resources.
02.10 Explain the interaction of one natural resource with another.
02.11 Describe the causes and effects of air, water, and land pollution and identify ways to prevent pollution.
02.12 Explain the flow of energy from the sun through agricultural systems.
02.13 Describe the environmental requirements necessary for a productive natural or man-made aquaculture system.
02.14 Apply principles of waste management to environmental problems common to agricultural systems.

02.15 Understand the concept of best management practices (BMP) as applied to agriculture.
02.16 Identify advances in biotechnology impacting agriculture such as transgenic crops and biological controls.
02.17 Identify computer technology advances such as Geographic Information Systems (GIS) and Global Positioning Systems (GPS).

03.0 PRACTICE AGRICULTURAL SAFETY--The student will be able to:

03.01 List the most common causes of agricultural accidents.
03.02 Discuss the importance of following proper safety precautions in the agricultural industry.
03.03 Demonstrate safety procedures in the classroom, laboratory, and workplace.
03.04 Describe symptoms of pesticide poisoning.
03.05 Extract pertinent information from a pesticide label and Material Safety Data Sheet (MSDS).
03.06 Select, mix, and apply a nonrestricted chemical, according to the label and according to Environmental Protection Agency (EPA), MSDS, and Worker Protection Standard regulations.
03.07 Clean and store pesticide application equipment, safety clothing, and safety equipment.
03.08 Identify the proper disposal of containers and residual pesticides.
03.09 Discuss the proper procedures of basic first aid and cardiopulmonary resuscitation (CPR).

04.0 DEMONSTRATE THE USE OF TOOLS, EQUIPMENT AND INSTRUMENTS IN THE AGRICULTURAL INDUSTRY--The student will be able to:

04.01 Choose the proper tools, equipment, and instruments for a specific job.
04.02 Describe the principles of selected mechanical applications (e.g. levers, pulleys, hydraulics, internal combustion).
04.03 Calibrate spray equipment; solve time, distance, area, volume ratio, proportion, and percentage problems in agriscience.
04.04 Demonstrate the ability to use an equipment manual.
04.05 Demonstrate the use of selected tools, equipment, and instruments.
04.06 Service, maintain, and store tools, equipment, instruments, and supplies.

05.0 DESCRIBE THE PRINCIPLES OF PEST MANAGEMENT --The student will be able to:

05.01 Identify types of pests and beneficials.
05.02 Identify and select an appropriate control for each type of pest and/or weed.
05.03 Describe the principles and benefits of integrated pest management.

06.0 DESCRIBE THE PRINCIPLES OF PLANT AND/OR ANIMAL NUTRIENT GROWTH AND REPRODUCTION--The student will be able to:

For plant:

06.01 Describe the structure functions of plant parts including roots, stems, leaves, and flowers.
06.02 Describe the processes of plant growth including photosynthesis, respiration and nutrient uptake.
06.03 Propagate plants through sexual and asexual means.
06.04 Identify the nutrients required for plant growth and development and the role of each.
06.05 Extract pertinent information from a fertilizer label.

For animal:

06.07 Identify the nutrients required for animal growth and development and the role of each.
06.08 Identify and describe the anatomical systems of animals and the functions of each, including major components.
06.09 Describe the process of animal reproduction.

07.0 APPLY BUSINESS SKILLS AND ECONOMIC PRINCIPLES TO THE AGRICULTURAL INDUSTRY--The student will be able to:

07.01 Explain the basic economic principles in the agricultural industry.
07.02 Explain the importance and impacts of local, state, and federal regulations and required documentation affecting the agricultural industry.
07.03 Describe the types of agribusiness by organizational structure (i.e. sole proprietorship, partnership, corporation, cooperatives).
07.04 Select and use computer applications.
07.05 Analyze and interpret agribusiness data.
07.06 Keep and maintain supervised agricultural experience (SAE) records.
07.07 Interpret legal descriptions of land.

08.0 EXPLAIN THE BASIC MARKETING PROCESSES IN THE AGRICULTURAL INDUSTRY--The student will be able to:

08.01 Describe key factors in marketing agricultural products.
08.02 Select agricultural products according to grades and standards.

09.0 DEMONSTRATE HUMAN-RELATIONS, COMMUNICATIONS, AND LEADERSHIP SKILLS--The student will be able to:

09.01 Demonstrate acceptable work habits and attitudes.
09.02 Correctly follow oral and written directions and ask questions that clarify directions, as needed.
09.03 Communicate effectively in verbal, written, and nonverbal modes.
09.04 Recognize and demonstrate good listening skills.
09.05 Conduct small informal and formal group meetings.

09.06 Identify the opportunities for leadership development available through an appropriate student and/or professional organization.
09.07 Recognize and demonstrate communications skills in the workplace.
09.08 Demonstrate effective telephone skills.

10.0 DESCRIBE BIOTECHNOLOGY APPLICATIONS IN THE AGRICULTURAL INDUSTRY--The student will be able to:

10.01 Explain how biotechnology has impacted the production of agricultural goods.
10.02 Describe the importance of biotechnology in providing an adequate supply of food and fiber.
10.03 Explain how biotechnology has affected careers in agriculture.
10.04 Suggest possible biotechnology solutions to current agricultural problems.

11.0 CONDUCT SCIENTIFIC INVESTIGATION AND APPLY RESULTS--The student will be able to:

11.01 Describe the major steps of scientific inquiry (the scientific method).
11.02 Design an agricultural experiment using appropriate control measures.
11.03 Devise a system for recording data.
11.04 Prepare a report on the experiment conducted.
11.05 Plan and conduct follow-up experiments using the scientific method.
11.06 Discuss research being conducted in agriculture.
11.07 Assess the risks and benefits of agricultural technology to society.
11.08 Summarize data and draw appropriate conclusions.
11.09 Collect and record data using SI units.

12.0 DEMONSTRATE LEADERSHIP, EMPLOYABILITY, COMMUNICATION AND HUMAN RELATION SKILLS--The student will be able to:

12.01 Conduct group meetings using parliamentary procedure and public speaking skills.
12.02 Follow acceptable work habits and personal characteristics.
12.03 Follow acceptable employee hygiene habits.
12.04 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons.
12.05 Conduct a job search and identify advanced training opportunities and the requirements.
12.06 Demonstrate an understanding of team planning, problem solving and how communications processes and individuals contribute to the group.
12.07 Prepare a resume.
12.08 Work effectively as a team member.
12.09 Communicate well with others.
12.10 Present a written and an oral report.

13.0 PRACTICE AGRICULTURAL LABORATORY SAFETY--The student will be able to:

13.01 Identify first aid supplies, personnel and emergency protection areas.
13.02 Use appropriate safety procedures and guidelines.
13.03 Monitor, use, store and dispose of hazardous materials properly.
13.04 Understand and follow Material Safety Data Sheets (MSDS) and Occupational Safety and Health Administration (OSHA) standards.
13.05 Understand and utilize safety equipment.
13.06 Identify safety symbols and signs.

14.0 DEMONSTRATE PROPER USE OF AGRICULTURAL LABORATORY EQUIPMENT AND MATERIALS--The student will be able to:

14.01 Practice aseptic techniques.
14.02 Perform mathematical calculations and conversions.
14.03 Make stock reagents and solutions.
14.04 Monitor physical properties of a solution.
14.05 Sterilize and prepare equipment.
14.06 Make and dispense media.
14.07 Maintain reagent integrity.
14.08 Maintain inventory of laboratory supplies.
14.09 Use basic weighing and measuring techniques.
14.10 Perform basic separation techniques.
14.11 Handle and store biological materials.
14.12 Use specialized equipment in the laboratory.

15.0 DESCRIBE THE FUNDAMENTALS OF BIOTECHNOLOGY--The student will be able to:

15.01 Describe the cell as the basic unit of life.
15.02 Describe the importance of single-celled organisms to agriculture.
15.03 Explain how the knowledge of cells is important to agriculture.
15.04 Analyze the difference between plant cells and animal cells.
15.05 Explain the variations in different types of cells.
15.06 Describe cellular structure.
15.07 Give examples of agricultural uses of cellular structures.
15.08 Analyze the functions of various parts of cells.
15.09 Explain the Mendel Theory of Genetics.
15.10 Analyze a Punnett Square.
15.11 Discuss the make-up of chromosomes.
15.12 Discuss the process of DNA transfer.
15.13 Describe the relationship of cellular science and biotechnology.

16.0 INVESTIGATE THE USE OF BIOTECHNOLOGY IN PLANT AND/OR ANIMAL SCIENCE--The student will be able to:

For plant:

16.01 Explain how the inheritance of traits in plants is regulated.
16.02 Apply basic principles of plant genetics.
16.03 Describe the process of pollination in plants.

16.04 Explain how biotechnology is being used in combination with conventional plant breeding programs.
16.05 Determine the effects of moisture, temperature, oxygen, and light on seed germination.
16.06 Explain the major steps in the seed germination process.
16.07 Describe the role of enzymes and hormones in seed germination.
16.08 Explain the major steps in the seed germination process.
16.09 Apply basic micropropagation techniques.
16.10 Describe and examine the effects of plant growth regulators.
16.11 Describe the factors that affect nutrient levels contained in plant tissues.
16.12 Describe nutrient uptake and translocation processes.
16.13 Compare plant nutrient levels by stage growth.
16.14 Describe how herbicides work within plants to cause injury or death.
16.15 Explain the differential effects of herbicides.
16.16 Determine the influence of climatic conditions, plant characteristics, and application techniques on herbicide effectiveness.

For animal:

16.17 Discuss the interdependence of systems in an animal's body.
16.18 Specify how genetic principles are used in animal breeding.
16.19 Explain how crossbred animals are developed.
16.20 Explain the steps involved in meiosis.
16.21 Explain the process of natural fertilization.
16.22 Explain alternate reproductive technologies.
16.23 Research career opportunities in animal science.
16.24 Analyze the factors influencing animal growth.
16.25 Explain the stages of animal growth.
16.26 Identify the prevalent diseases and parasites and their biological impact on animals.
16.27 Describe the proper methods of prevention and treatment of diseases and parasites that affect animals.
16.28 Research environmental issues affecting animal science.

17.0 COLLECT AND TEST SAMPLES USED TO DETERMINE SOIL CHARACTERISTICS -- The student will be able to:

17.01 Collect soil samples from test area and complete soil data forms.
17.02 Determine soil pH using pH test kit.
17.03 Conduct soil, mineral and elemental analysis using soil test kit.
17.04 Determine and record texture, structure, temperature and color of each soil layer.
17.05 Construct a soil profile or soil pit.
17.06 Analyze soil data and write lab report.
17.01 Determine the effect of texture, density, and porosity on permeability/infiltration rates.
17.02 Examine the relationship between soil texture, water movement and water holding capacity.

18.0 DETERMINE THE QUALITY AND QUANTITY OF WATER RESOURCES -- The student will be able to:

18.01 Determine quality of groundwater and surface water.
18.02 Determine stream flow.
18.03 Collect, store and label water samples from a representative test site.
18.04 Determine the quality of water samples by measuring for pH, turbidity, dissolved solids and dissolved oxygen.
18.05 Investigate water shed boundaries and drainage patterns.
18.06 Monitor water levels of rivers, streams, ponds and lakes.
18.07 Identify and monitor erosion hazards and environmental quality.
18.08 Differentiate between point and non-point sources of pollution.

19.0 IDENTIFY, CLASSIFY AND PRESERVE SAMPLES AND SPECIMENS OF NATIVE FLORA AND FAUNA -- The student will be able to:

19.01 Demonstrate appropriate sampling methods for aquatic, wetland and upland applications.
19.02 Demonstrate the proper use of field instruments.
19.03 Identify invasive species and their impact on the environment
19.04 Perform a comprehensive ecological study of a forest.
19.05 Identify threatened and endangered upland species, range and habitat.

20.0 IDENTIFY MAJOR ECOSYSTEMS IN FLORIDA -- The student will be able to:

20.01 Identify common plant and animal species of the major ecosystems.
20.02 Identify environmental factors affecting Florida major ecosystems.
20.03 Identify threatened and endangered plant and animal species of specific habitats.
20.04 Analyze political, biological, economical, and sociological impacts on managing ecosystems.
20.05 Trace the effects of pollution through a food chain.
20.06 Demonstrate knowledge of biodegradable and non-biodegradable products.
20.07 Explain how lack of predation contributes to uncontrollable exotic populations.
20.08 Explain how exotic populations stress native populations occupying the same niche.
20.09 Develop and discuss theoretical strategies for managing/eradicating exotic species.

21.0 COLLECT, RECORD AND ANALYZE DATA -- The student will be able to:

21.01 Maintain lab journal.
21.02 Construct data tables.
21.03 Compile data.
21.04 Make inferences from data.
21.05 Use word processing, databases, computer graphics statistics programs, spreadsheets, Internet, Global Information Systems (GIS) and graphing calculators.

22.0 DEMONSTRATE ORIENTEERING AND MAP READING SKILLS--The student will be able to:

22.01 Interpret legal land descriptions.
22.02 Explain topographic map symbols and legends.
22.03 Measure acreage on maps.
22.04 Determine location and other information from maps.
22.05 Measure elevation in the field using a clinometer.

23.0 RESEARCH ENVIRONMENTAL ISSUES--The student will be able to:

23.01 Conduct an environmental issue investigation.
23.02 Develop an action plan based on investigation.
23.03 Prepare and present oral and written presentation.

24.0 UNDERSTAND THE MANAGEMENT OF LANDS--The student will be able to:

24.01 Describe the management of federal lands.
24.02 Describe the management of state lands.
24.03 Describe the management of local lands.
24.04 Describe the management of private lands.
24.05 Demonstrate how burning of vegetation releases nutrients into the soil.
24.06 Investigate the merits of growing season burns versus non-growing season burns.
24.07 Demonstrate personal safety precautions for controlled burns.

25.0 INVESTIGATE THE APPLICATION OF WEATHER SYSTEMS IN THE AGRICULTURAL INDUSTRY--The student will be able to:

25.01 Interpret a weather map.
25.02 Obtain and record measurements of local rainfall, temperature, air pressure, relative humidity, cloud cover and type, and wind speed.
25.03 Demonstrate the use of a hurricane-tracking chart.
25.04 Describe the function of the ozone layer and the impact of technology on it.

26.0 DESCRIBE GAME AND NON-GAME WILDLIFE PROGRAMS IN FLORIDA--The student will be able to:

26.01 Explain the laws of hunting and fishing.
26.02 Explain the laws that protect non-game species.
26.03 Identify endangered species in Florida.

27.0 IDENTIFY COMMODITY AND NON-COMMODITY RESOURCES--The student will be able to:

27.01 Describe commodity resources.
27.02 Describe non-commodity resources.
27.03 Compare and contrast commodity and non-commodity resources in a selected ecosystem.

28.0 PRACTICE SUSTAINABLE AGRICULTURE -- The student will be able to:

28.01 Apply principles of waste management to environmental problems.
28.02 Analyze the impact of recent technological advances on the agricultural industry.
28.03 Identify plant growth problems.
28.04 Apply Best Management Practices (BMP).

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Course Number: 8106810
Course Title: Agriscience Foundations I
Course Credit: 1

COURSE DESCRIPTION:

This course was developed as a core and is designed to develop competencies in the areas of agricultural history; global importance of agriculture; career opportunities; applied scientific and technological concepts; ecosystems; agricultural safety; principles of integrated pest management; principles of plant and animal growth; economic principles; agricultural marketing; and human relations skills.

01.0 DESCRIBE THE SOCIOECONOMIC ROLE OF THE AGRICULTURAL INDUSTRY--The student will be able to:

- 01.01 Prepare a report on the history of the agricultural industry.
- 01.02 Discuss the impact of agricultural products and services on the local, state, national, and global economy.
- 01.03 Investigate career opportunities in the agricultural industry and identify educational experiences necessary to prepare for those careers.
- 01.04 Discuss the role of the agricultural industry in the interaction of population, food, energy, and the environment.

02.0 APPLY SCIENTIFIC AND TECHNOLOGICAL PRINCIPLES TO THE AGRICULTURAL INDUSTRY--The student will be able to:

- 02.01 Discuss the importance of scientific classification in agriculture.
- 02.02 Use the scientific method to solve problems in agriculture.
- 02.03 Explain the use of genetics in agriculture, including probability applications.
- 02.04 Analyze the impact of recent technology on the agricultural industry.
- 02.05 Identify and describe the components of an ecosystem both biotic and abiotic.
- 02.06 Construct and analyze a diagram of a biological food web and subsequent food chains.
- 02.07 Describe and diagram the water, carbon, nitrogen, oxygen, sulfur, and phosphorus cycles.
- 02.08 Evaluate soil profiles, land-capability classes, and soil conservation practices.
- 02.09 List the components of Florida's fresh water systems (lakes, ground water, aquifer, sink holes, rivers, and swamps) and explain the importance of managing these resources.
- 02.10 Explain the interaction of one natural resource with another.

02.11 Describe the causes and effects of air, water, and land pollution and identify ways to prevent pollution.
02.12 Explain the flow of energy from the sun through agricultural systems.
02.13 Describe the environmental requirements necessary for a productive natural or man-made aquaculture system.
02.14 Apply principles of waste management to environmental problems common to agricultural systems.
02.15 Understand the concept of best management practices (BMP) as applied to agriculture.
02.16 Identify advances in biotechnology impacting agriculture such as transgenic crops and biological controls.
02.17 Identify computer technology advances such as Geographic Information Systems (GIS) and Global Positioning Systems (GPS).

03.0 PRACTICE AGRICULTURAL SAFETY--The student will be able to:

03.01 List the most common causes of agricultural accidents.
03.02 Discuss the importance of following proper safety precautions in the agricultural industry.
03.03 Demonstrate safety procedures in the classroom, laboratory, and workplace.
03.04 Describe symptoms of pesticide poisoning.
03.05 Extract pertinent information from a pesticide label and Material Safety Data Sheet (MSDS).
03.06 Select, mix, and apply a nonrestricted chemical, according to the label and according to Environmental Protection Agency (EPA), MSDS, and Worker Protection Standard regulations.
03.07 Clean and store pesticide application equipment, safety clothing, and safety equipment.
03.08 Identify the proper disposal of containers and residual pesticides.
03.09 Discuss the proper procedures of basic first aid and cardiopulmonary resuscitation (CPR).

04.0 DEMONSTRATE THE USE OF TOOLS, EQUIPMENT AND INSTRUMENTS IN THE AGRICULTURAL INDUSTRY--The student will be able to:

04.01 Choose the proper tools, equipment, and instruments for a specific job.
04.02 Describe the principles of selected mechanical applications (e.g. levers, pulleys, hydraulics, internal combustion).
04.03 Calibrate spray equipment; solve time, distance, area, volume ratio, proportion, and percentage problems in agriscience.
04.04 Demonstrate the ability to use an equipment manual.
04.05 Demonstrate the use of selected tools, equipment, and instruments.
04.06 Service, maintain, and store tools, equipment, instruments, and supplies.

05.0 DESCRIBE THE PRINCIPLES OF PEST MANAGEMENT --The student will be able to:

05.01 Identify types of pests and beneficials.

05.02 Identify and select an appropriate control for each type of pest and/or weed.
05.03 Describe the principles and benefits of integrated pest management.

06.0 DESCRIBE THE PRINCIPLES OF PLANT AND/OR ANIMAL NUTRIENT GROWTH AND REPRODUCTION--The student will be able to:

For plant:

06.01 Describe the structure functions of plant parts including roots, stems, leaves, and flowers.
06.02 Describe the processes of plant growth including photosynthesis, respiration and nutrient uptake.
06.03 Propagate plants through sexual and asexual means.
06.04 Identify the nutrients required for plant growth and development and the role of each.
06.05 Extract pertinent information from a fertilizer label.

For animal:

06.07 Identify the nutrients required for animal growth and development and the role of each.
06.08 Identify and describe the anatomical systems of animals and the functions of each, including major components.
06.09 Describe the process of animal reproduction.

07.0 APPLY BUSINESS SKILLS AND ECONOMIC PRINCIPLES TO THE AGRICULTURAL INDUSTRY--The student will be able to:

07.01 Explain the basic economic principles in the agricultural industry.
07.02 Explain the importance and impacts of local, state, and federal regulations and required documentation affecting the agricultural industry.
07.03 Describe the types of agribusiness by organizational structure (i.e. sole proprietorship, partnership, corporation, cooperatives).
07.04 Select and use computer applications.
07.05 Analyze and interpret agribusiness data.
07.06 Keep and maintain supervised agricultural experience (SAE) records.
07.07 Interpret legal descriptions of land.

08.0 EXPLAIN THE BASIC MARKETING PROCESSES IN THE AGRICULTURAL INDUSTRY--The student will be able to:

08.01 Describe key factors in marketing agricultural products.
08.02 Select agricultural products according to grades and standards.

09.0 DEMONSTRATE HUMAN-RELATIONS, COMMUNICATIONS, AND LEADERSHIP SKILLS--The student will be able to:

09.01 Demonstrate acceptable work habits and attitudes.

09.02 Correctly follow oral and written directions and ask questions that clarify directions, as needed.
09.03 Communicate effectively in verbal, written, and nonverbal modes.
09.04 Recognize and demonstrate good listening skills.
09.05 Conduct small informal and formal group meetings.
09.06 Identify the opportunities for leadership development available through an appropriate student and/or professional organization.
09.07 Recognize and demonstrate communications skills in the workplace.
09.08 Demonstrate effective telephone skills.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Course Number: 8106850
Course Title: Agricultural Biotechnology 2
Course Credit: 1

COURSE DESCRIPTION:

This course was developed as a core and is designed to develop competencies in the areas of agricultural biotechnology in agriculture, scientific investigation, laboratory safety, scientific and technological concepts; and the fundamentals of biotechnology.

10.0 DESCRIBE BIOTECHNOLOGY APPLICATIONS IN THE AGRICULTURAL INDUSTRY--The student will be able to:

- 10.01 Explain how biotechnology has impacted the production of agricultural goods.
- 10.02 Describe the importance of biotechnology in providing an adequate supply of food and fiber.
- 10.03 Explain how biotechnology has affected careers in agriculture.
- 10.04 Suggest possible biotechnology solutions to current agricultural problems.

11.0 CONDUCT SCIENTIFIC INVESTIGATION AND APPLY RESULTS--The student will be able to:

- 11.01 Describe the major steps of scientific inquiry (the scientific method).
- 11.02 Design an agricultural experiment using appropriate control measures.
- 11.03 Devise a system for recording data.
- 11.04 Prepare a report on the experiment conducted.
- 11.05 Plan and conduct follow-up experiments using the scientific method.
- 11.06 Discuss research being conducted in agriculture.
- 11.07 Assess the risks and benefits of agricultural technology to society.
- 11.08 Summarize data and draw appropriate conclusions.
- 11.09 Collect and record data using SI units.

12.0 DEMONSTRATE LEADERSHIP, EMPLOYABILITY, COMMUNICATION AND HUMAN RELATION SKILLS--The student will be able to:

- 12.01 Conduct group meetings using parliamentary procedure and public speaking skills.
- 12.02 Follow acceptable work habits and personal characteristics.
- 12.03 Follow acceptable employee hygiene habits.
- 12.04 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons.

12.05 Conduct a job search and identify advanced training opportunities and the requirements.
12.06 Demonstrate an understanding of team planning, problem solving and how communications processes and individuals contribute to the group.
12.07 Prepare a resume.
12.08 Work effectively as a team member.
12.09 Communicate well with others.
12.10 Present a written and an oral report.

13.0 PRACTICE AGRICULTURAL LABORATORY SAFETY--The student will be able to:

13.01 Identify first aid supplies, personnel and emergency protection areas.
13.02 Use appropriate safety procedures and guidelines.
13.03 Monitor, use, store and dispose of hazardous materials properly.
13.04 Understand and follow Material Safety Data Sheets (MSDS) and Occupational Safety and Health Administration (OSHA) standards.
13.05 Understand and utilize safety equipment.
13.06 Identify safety symbols and signs.

14.0 DEMONSTRATE PROPER USE OF AGRICULTURAL LABORATORY EQUIPMENT AND MATERIALS--The student will be able to:

14.01 Practice aseptic techniques.
14.02 Perform mathematical calculations and conversions.
14.03 Make stock reagents and solutions.
14.04 Monitor physical properties of a solution.
14.05 Sterilize and prepare equipment.
14.06 Make and dispense media.
14.07 Maintain reagent integrity.
14.08 Maintain inventory of laboratory supplies.
14.09 Use basic weighing and measuring techniques.
14.10 Perform basic separation techniques.
14.11 Handle and store biological materials.
14.12 Use specialized equipment in the laboratory.

15.0 DESCRIBE THE FUNDAMENTALS OF BIOTECHNOLOGY--The student will be able to:

15.01 Describe the cell as the basic unit of life.
15.02 Describe the importance of single-celled organisms to agriculture.
15.03 Explain how the knowledge of cells is important to agriculture.
15.04 Analyze the difference between plant cells and animal cells.
15.05 Explain the variations in different types of cells.
15.06 Describe cellular structure.
15.07 Give examples of agricultural uses of cellular structures.
15.08 Analyze the functions of various parts of cells.
15.09 Explain the Mendel Theory of Genetics.
15.10 Analyze a Punnett Square.
15.11 Discuss the make-up of chromosomes.
15.12 Discuss the process of DNA transfer.

15.13 Describe the relationship of cellular science and biotechnology.

16.0 INVESTIGATE THE USE OF BIOTECHNOLOGY IN PLANT AND/OR ANIMAL SCIENCE--The student will be able to:

For plant:

16.01 Explain how the inheritance of traits in plants is regulated.
16.02 Apply basic principles of plant genetics.
16.03 Describe the process of pollination in plants.
16.04 Explain how biotechnology is being used in combination with conventional plant breeding programs.
16.05 Determine the effects of moisture, temperature, oxygen, and light on seed germination.
16.06 Explain the major steps in the seed germination process.
16.07 Describe the role of enzymes and hormones in seed germination.
16.08 Explain the major steps in the seed germination process.
16.09 Apply basic micropropagation techniques.
16.10 Describe and examine the effects of plant growth regulators.
16.11 Describe the factors that affect nutrient levels contained in plant tissues.
16.12 Describe nutrient uptake and translocation processes.
16.13 Compare plant nutrient levels by stage growth.
16.14 Describe how herbicides work within plants to cause injury or death.
16.15 Explain the differential effects of herbicides.
16.16 Determine the influence of climatic conditions, plant characteristics, and application techniques on herbicide effectiveness.

For animal:

16.17 Discuss the interdependence of systems in an animal’s body.
16.18 Specify how genetic principles are used in animal breeding.
16.19 Explain how crossbred animals are developed.
16.20 Explain the steps involved in meiosis.
16.21 Explain the process of natural fertilization.
16.22 Explain alternate reproductive technologies.
16.23 Research career opportunities in animal science.
16.24 Analyze the factors influencing animal growth.
16.25 Explain the stages of animal growth.
16.26 Identify the prevalent diseases and parasites and their biological impact on animals.
16.27 Describe the proper methods of prevention and treatment of diseases and parasites that affect animals.
16.28 Research environmental issues affecting animal science.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Course Number: 8113010
Course Title: Environmental Resources 3
Course Credit: 1

COURSE DESCRIPTION:

This course is designed to develop competencies in the areas of water resources, native flora and fauna, Florida ecosystems, soil characteristics, and collecting, recording and analyzing data

17.0 COLLECT AND TEST SAMPLES USED TO DETERMINE SOIL CHARACTERISTICS -- The student will be able to:

17.01 Collect soil samples from test area and complete soil data forms.
17.02 Determine soil pH using pH test kit.
17.03 Conduct soil, mineral and elemental analysis using soil test kit.
17.04 Determine and record texture, structure, temperature and color of each soil layer.
17.05 Construct a soil profile or soil pit.
17.06 Analyze soil data and write lab report.
17.01 Determine the effect of texture, density, and porosity on permeability/infiltration rates.
17.02 Examine the relationship between soil texture, water movement and water holding capacity.

18.0 DETERMINE THE QUALITY AND QUANTITY OF WATER RESOURCES -- The student will be able to:

18.01 Determine quality of groundwater and surface water.
18.02 Determine stream flow.
18.03 Collect, store and label water samples from a representative test site.
18.04 Determine the quality of water samples by measuring for pH, turbidity, dissolved solids and dissolved oxygen.
18.05 Investigate water shed boundaries and drainage patterns.
18.06 Monitor water levels of rivers, streams, ponds and lakes.
18.07 Identify and monitor erosion hazards and environmental quality.
18.08 Differentiate between point and non-point sources of pollution.

19.0 IDENTIFY, CLASSIFY AND PRESERVE SAMPLES AND SPECIMENS OF NATIVE FLORA AND FAUNA -- The student will be able to:

19.01 Demonstrate appropriate sampling methods for aquatic, wetland and upland applications.
19.02 Demonstrate the proper use of field instruments.
19.03 Identify invasive species and their impact on the environment
19.04 Perform a comprehensive ecological study of a forest.
19.05 Identify threatened and endangered upland species, range and habitat.

20.0 IDENTIFY MAJOR ECOSYSTEMS IN FLORIDA -- The student will be able to:

20.01 Identify common plant and animal species of the major ecosystems.
20.02 Identify environmental factors affecting Florida's major ecosystems.
20.03 Identify threatened and endangered plant and animal species of specific habitats.
20.04 Analyze political, biological, economical, and sociological impacts on managing ecosystems.
20.05 Trace the effects of pollution through a food chain.
20.06 Demonstrate knowledge of biodegradable and non-biodegradable products.
20.07 Explain how lack of predation contributes to uncontrollable exotic populations.
20.08 Explain how exotic populations stress native populations occupying the same niche.
20.09 Develop and discuss theoretical strategies for managing/eradicating exotic species.

21.0 COLLECT, RECORD AND ANALYZE DATA -- The student will be able to:

21.01 Maintain lab journal.
21.02 Construct data tables.
21.03 Compile data.
21.04 Make inferences from data.
21.05 Use word processing, databases, computer graphics statistics programs, spreadsheets, Internet, Global Information Systems (GIS) and graphing calculators.

22.0 DEMONSTRATE ORIENTEERING AND MAP READING SKILLS--The student will be able to:

22.01 Interpret legal land descriptions.
22.02 Explain topographic map symbols and legends.
22.03 Measure acreage on maps.
22.04 Determine location and other information from maps.
22.05 Measure elevation in the field using a clinometer.

23.0 RESEARCH ENVIRONMENTAL ISSUES--The student will be able to:

23.01 Conduct an environmental issue investigation.
23.02 Develop an action plan based on investigation.
23.03 Prepare and present oral and written presentation.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Course Number: 8113020
Course Title: Environmental Resources 4
Course Credit: 1

COURSE DESCRIPTION:

This course is designed to develop competencies in the areas of land management, weather systems, wildlife programs, commodity and non-commodity resources, sustainable agriculture and environmental research.

23.0 RESEARCH ENVIRONMENTAL ISSUES--The student will be able to:

- 23.01 Conduct an environmental issue investigation.
- 23.02 Develop an action plan based on investigation.
- 23.03 Prepare and present oral and written presentation.

24.0 UNDERSTAND THE MANAGEMENT OF LANDS--The student will be able to:

- 24.01 Describe the management of federal lands.
- 24.02 Describe the management of state lands.
- 24.03 Describe the management of local lands.
- 24.04 Describe the management of private lands.
- 24.05 Demonstrate how burning of vegetation releases nutrients into the soil.
- 24.06 Investigate the merits of growing season burns versus non-growing season burns.
- 24.07 Demonstrate personal safety precautions for controlled burns.

25.0 INVESTIGATE THE APPLICATION OF WEATHER SYSTEMS IN THE AGRICULTURAL INDUSTRY--The student will be able to:

- 25.01 Interpret a weather map.
- 25.02 Obtain and record measurements of local rainfall, temperature, air pressure, relative humidity, cloud cover and type, and wind speed.
- 25.03 Demonstrate the use of a hurricane-tracking chart.
- 25.04 Describe the function of the ozone layer and the impact of technology on it.

26.0 DESCRIBE GAME AND NON-GAME WILDLIFE PROGRAMS IN FLORIDA--The student will be able to:

- 26.01 Explain the laws of hunting and fishing.
- 26.02 Explain the laws that protect non-game species.
- 26.03 Identify endangered species in Florida.

27.0 IDENTIFY COMMODITY AND NON-COMMODITY RESOURCES--The student will be able to:

27.01 Describe commodity resources.
27.02 Describe non-commodity resources.
27.03 Compare and contrast commodity and non-commodity resources in a selected ecosystem.

28.0 PRACTICE SUSTAINABLE AGRICULTURE -- The student will be able to:

28.01 Apply principles of waste management to environmental problems.
28.02 Analyze the impact of recent technological advances on the agricultural industry.
28.03 Identify plant growth problems.
28.04 Apply Best Management Practices (BMP).

Florida Department of Education
INTENDED OUTCOMES

Program Title: PLANT BIOTECHNOLOGY

Secondary

Program Number	**8106500**
CIP Number	0102.040100
Grade Level	9-12 30, 31
Length	3 credits
Certification	VOC AGRI @4
	AGRICULTUR 1 @2
	AGRI @4

INTENDED OUTCOMES: After successfully completing this program the student will be able to:

OCCUPATIONAL COMPLETION POINT - DATA CODE A
Biological Aide (agriculture) - DOT Code 049.364-018

01.0 Describe the socioeconomic role of the agricultural industry.
02.0 Apply scientific and technological principles to the agricultural industry.
03.0 Practice agricultural safety.
04.0 Demonstrate the use of tools, equipment and instruments in the agricultural industry.
05.0 Describe the principles of integrated pest management (IPM).
06.0 Describe the principles of plant and/or animal growth and reproduction.
07.0 Apply business skills and economic principles to the agricultural industry.
08.0 Explain the basic marketing processes in the agricultural industry.
09.0 Demonstrate human relations, communications, and leadership skills.
10.0 Describe biotechnology applications in the agricultural industry.
11.0 Conduct scientific investigation and apply results.
12.0 Demonstrate leadership, employability, communication and human relation skills.
13.0 Practice agricultural laboratory safety.
14.0 Demonstrate proper use of agricultural laboratory equipment and materials.
15.0 Describe the fundamentals of biotechnology.
16.0 Investigate the use of biotechnology in plant and/or animal science.
17.0 Describe plant classifications and the economic impact to your region.
18.0 Determine environmental, media and nutrient needs of selected plants.
19.0 Apply genetic principles to plant production.
20.0 Perform propagation.
21.0 Use plants to show nutrient absorption and the translocation process in plants.
22.0 Identify, determine mode of action, and control plant pathogens.
23.0 Demonstrate alternate methods of plant production.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Program Title: Plant Biotechnology
Secondary Number: 8106500
Postsecondary Number:

OCCUPATIONAL COMPLETION POINT - DATA CODE A
Biological Aide (agriculture) - DOT Code 049.364-018

01.0 DESCRIBE THE SOCIOECONOMIC ROLE OF THE AGRICULTURAL INDUSTRY--The student will be able to:

01.01 Prepare a report on the history of the agricultural industry.
01.02 Discuss the impact of agricultural products and services on the local, state, national, and global economy.
01.03 Investigate career opportunities in the agricultural industry and identify educational experiences necessary to prepare for those careers.
01.04 Discuss the role of the agricultural industry in the interaction of population, food, energy, and the environment.

02.0 APPLY SCIENTIFIC AND TECHNOLOGICAL PRINCIPLES TO THE AGRICULTURAL INDUSTRY--The student will be able to:

02.01 Discuss the importance of scientific classification in agriculture.
02.02 Use the scientific method to solve problems in agriculture.
02.03 Explain the use of genetics in agriculture, including probability applications.
02.04 Analyze the impact of recent technology on the agricultural industry.
02.05 Identify and describe the components of an ecosystem both biotic and abiotic.
02.06 Construct and analyze a diagram of a biological food web and subsequent food chains.
02.07 Describe and diagram the water, carbon, nitrogen, oxygen, sulfur, and phosphorus cycles.
02.08 Evaluate soil profiles, land-capability classes, and soil conservation practices.
02.09 List the components of Florida's fresh water systems (lakes, ground water, aquifer, sink holes, rivers, and swamps) and explain the importance of managing these resources.
02.10 Explain the interaction of one natural resource with another.
02.11 Describe the causes and effects of air, water, and land pollution and identify ways to prevent pollution.
02.12 Explain the flow of energy from the sun through agricultural systems.
02.13 Describe the environmental requirements necessary for a productive natural or man-made aquaculture system.
02.14 Apply principles of waste management to environmental problems common to agricultural systems.

02.15 Understand the concept of best management practices (BMP) as applied to agriculture.
02.16 Identify advances in biotechnology impacting agriculture such as transgenic crops and biological controls.
02.17 Identify computer technology advances such as Geographic Information Systems (GIS) and Global Positioning Systems (GPS).

03.0 PRACTICE AGRICULTURAL SAFETY--The student will be able to:

03.01 List the most common causes of agricultural accidents.
03.02 Discuss the importance of following proper safety precautions in the agricultural industry.
03.03 Demonstrate safety procedures in the classroom, laboratory, and workplace.
03.04 Describe symptoms of pesticide poisoning.
03.05 Extract pertinent information from a pesticide label and Material Safety Data Sheet (MSDS).
03.06 Select, mix, and apply a nonrestricted chemical, according to the label and according to Environmental Protection Agency (EPA), MSDS, and Worker Protection Standard regulations.
03.07 Clean and store pesticide application equipment, safety clothing, and safety equipment.
03.08 Identify the proper disposal of containers and residual pesticides.
03.09 Discuss the proper procedures of basic first aid and cardiopulmonary resuscitation (CPR).

04.0 DEMONSTRATE THE USE OF TOOLS, EQUIPMENT AND INSTRUMENTS IN THE AGRICULTURAL INDUSTRY--The student will be able to:

04.01 Choose the proper tools, equipment, and instruments for a specific job.
04.02 Describe the principles of selected mechanical applications (e.g. levers, pulleys, hydraulics, internal combustion).
04.03 Calibrate spray equipment; solve time, distance, area, volume ratio, proportion, and percentage problems in agriscience.
04.04 Demonstrate the ability to use an equipment manual.
04.05 Demonstrate the use of selected tools, equipment, and instruments.
04.06 Service, maintain, and store tools, equipment, instruments, and supplies.

05.0 DESCRIBE THE PRINCIPLES OF PEST MANAGEMENT --The student will be able to:

05.01 Identify types of pests and beneficials.
05.02 Identify and select an appropriate control for each type of pest and/or weed.
05.03 Describe the principles and benefits of integrated pest management.

06.0 DESCRIBE THE PRINCIPLES OF PLANT AND/OR ANIMAL NUTRIENT GROWTH AND REPRODUCTION--The student will be able to:

For plant:

06.01 Describe the structure functions of plant parts including roots, stems, leaves, and flowers.
06.02 Describe the processes of plant growth including photosynthesis, respiration and nutrient uptake.
06.03 Propagate plants through sexual and asexual means.
06.04 Identify the nutrients required for plant growth and development and the role of each.
06.05 Extract pertinent information from a fertilizer label.

For animal:

06.07 Identify the nutrients required for animal growth and development and the role of each.
06.08 Identify and describe the anatomical systems of animals and the functions of each, including major components.
06.09 Describe the process of animal reproduction.

07.0 APPLY BUSINESS SKILLS AND ECONOMIC PRINCIPLES TO THE AGRICULTURAL INDUSTRY--The student will be able to:

07.01 Explain the basic economic principles in the agricultural industry.
07.02 Explain the importance and impacts of local, state, and federal regulations and required documentation affecting the agricultural industry.
07.03 Describe the types of agribusiness by organizational structure (i.e. sole proprietorship, partnership, corporation, cooperatives).
07.04 Select and use computer applications.
07.05 Analyze and interpret agribusiness data.
07.06 Keep and maintain supervised agricultural experience (SAE) records.
07.07 Interpret legal descriptions of land.

08.0 EXPLAIN THE BASIC MARKETING PROCESSES IN THE AGRICULTURAL INDUSTRY--The student will be able to:

08.01 Describe key factors in marketing agricultural products.
08.02 Select agricultural products according to grades and standards.

09.0 DEMONSTRATE HUMAN-RELATIONS, COMMUNICATIONS, AND LEADERSHIP SKILLS--The student will be able to:

09.01 Demonstrate acceptable work habits and attitudes.
09.02 Correctly follow oral and written directions and ask questions that clarify directions, as needed.
09.03 Communicate effectively in verbal, written, and nonverbal modes.
09.04 Recognize and demonstrate good listening skills.
09.05 Conduct small informal and formal group meetings.

09.06 Identify the opportunities for leadership development available through an appropriate student and/or professional organization.
09.07 Recognize and demonstrate communications skills in the workplace.
09.08 Demonstrate effective telephone skills.

10.0 DESCRIBE BIOTECHNOLOGY APPLICATIONS IN THE AGRICULTURAL INDUSTRY--The student will be able to:

10.01 Explain how biotechnology has impacted the production of agricultural goods.
10.02 Describe the importance of biotechnology in providing an adequate supply of food and fiber.
10.03 Explain how biotechnology has affected careers in agriculture.
10.04 Suggest possible biotechnology solutions to current agricultural problems.

11.0 CONDUCT SCIENTIFIC INVESTIGATION AND APPLY RESULTS--The student will be able to:

11.01 Describe the major steps of scientific inquiry (the scientific method).
11.02 Design an agricultural experiment using appropriate control measures.
11.03 Devise a system for recording data.
11.04 Prepare a report on the experiment conducted.
11.05 Plan and conduct follow-up experiments using the scientific method.
11.06 Discuss research being conducted in agriculture.
11.07 Assess the risks and benefits of agricultural technology to society.
11.08 Summarize data and draw appropriate conclusions.
11.09 Collect and record data using SI units.

12.0 DEMONSTRATE LEADERSHIP, EMPLOYABILITY, COMMUNICATION AND HUMAN RELATION SKILLS--The student will be able to:

12.01 Conduct group meetings using parliamentary procedure and public speaking skills.
12.02 Follow acceptable work habits and personal characteristics.
12.03 Follow acceptable employee hygiene habits.
12.04 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons.
12.05 Conduct a job search and identify advanced training opportunities and the requirements.
12.06 Demonstrate an understanding of team planning, problem solving and how communications processes and individuals contribute to the group.
12.07 Prepare a resume.
12.08 Work effectively as a team member.
12.09 Communicate well with others.
12.10 Present a written and an oral report.

13.0 PRACTICE AGRICULTURAL LABORATORY SAFETY--The student will be able to:

13.01 Identify first aid supplies, personnel and emergency protection areas.
13.02 Use appropriate safety procedures and guidelines.
13.03 Monitor, use, store and dispose of hazardous materials properly.
13.04 Understand and follow Material Safety Data Sheets (MSDS) and Occupational Safety and Health Administration (OSHA) standards.
13.05 Understand and utilize safety equipment.
13.06 Identify safety symbols and signs.

14.0 DEMONSTRATE PROPER USE OF AGRICULTURAL LABORATORY EQUIPMENT AND MATERIALS--The student will be able to:

14.01 Practice aseptic techniques.
14.02 Perform mathematical calculations and conversions.
14.03 Make stock reagents and solutions.
14.04 Monitor physical properties of a solution.
14.05 Sterilize and prepare equipment.
14.06 Make and dispense media.
14.07 Maintain reagent integrity.
14.08 Maintain inventory of laboratory supplies.
14.09 Use basic weighing and measuring techniques.
14.10 Perform basic separation techniques.
14.11 Handle and store biological materials.
14.12 Use specialized equipment in the laboratory.

15.0 DESCRIBE THE FUNDAMENTALS OF BIOTECHNOLOGY--The student will be able to:

15.01 Describe the cell as the basic unit of life.
15.02 Describe the importance of single-celled organisms to agriculture.
15.03 Explain how the knowledge of cells is important to agriculture.
15.04 Analyze the difference between plant cells and animal cells.
15.05 Explain the variations in different types of cells.
15.06 Describe cellular structure.
15.07 Give examples of agricultural uses of cellular structures.
15.08 Analyze the functions of various parts of cells.
15.09 Explain the Mendel Theory of Genetics.
15.10 Analyze a Punnett Square.
15.11 Discuss the make-up of chromosomes.
15.12 Discuss the process of DNA transfer.
15.13 Describe the relationship of cellular science and biotechnology.

16.0 INVESTIGATE THE USE OF BIOTECHNOLOGY IN PLANT AND/OR ANIMAL SCIENCE--The student will be able to:

For plant:

16.01 Explain how the inheritance of traits in plants is regulated.
16.02 Apply basic principles of plant genetics.
16.03 Describe the process of pollination in plants.

16.04 Explain how biotechnology is being used in combination with conventional plant breeding programs.
16.05 Determine the effects of moisture, temperature, oxygen, and light on seed germination.
16.06 Explain the major steps in the seed germination process.
16.07 Describe the role of enzymes and hormones in seed germination.
16.08 Explain the major steps in the seed germination process.
16.09 Apply basic micropropagation techniques.
16.10 Describe and examine the effects of plant growth regulators.
16.11 Describe the factors that affect nutrient levels contained in plant tissues.
16.12 Describe nutrient uptake and translocation processes.
16.13 Compare plant nutrient levels by stage growth.
16.14 Describe how herbicides work within plants to cause injury or death.
16.15 Explain the differential effects of herbicides.
16.16 Determine the influence of climatic conditions, plant characteristics, and application techniques on herbicide effectiveness.

For animal:

16.17 Discuss the interdependence of systems in an animal's body.
16.18 Specify how genetic principles are used in animal breeding.
16.19 Explain how crossbred animals are developed.
16.20 Explain the steps involved in meiosis.
16.21 Explain the process of natural fertilization.
16.22 Explain alternate reproductive technologies.
16.23 Research career opportunities in animal science.
16.24 Analyze the factors influencing animal growth.
16.25 Explain the stages of animal growth.
16.26 Identify the prevalent diseases and parasites and their biological impact on animals.
16.27 Describe the proper methods of prevention and treatment of diseases and parasites that affect animals.
16.28 Research environmental issues affecting animal science.

17.0 DESCRIBE PLANT CLASSIFICATIONS AND THE ECONOMIC IMPACT TO YOUR REGION--The student will be able to:

17.01 Identify all plant classifications and conditions and the economic impact to your region.
17.02 Identify at least thirty plants by common and scientific names.

18.0 DETERMINE ENVIRONMENTAL, MEDIA AND NUTRIENT NEEDS OF SELECTED PLANTS--The student will be able to:

18.01 Conduct plot research to determine optimum productivity.
18.02 Conduct experiments related to fertilization rates.
18.03 Prepare and present report on plant trial experiments.
18.04 Design a plant culture facility for commercial use.

19.0 APPLY GENETIC PRINCIPLES TO PLANT PRODUCTION--The student will be able to:

19.01 Describe the relationship between reproduction and plant improvement.
19.02 Demonstrate the reproductive cycle in seed plants.
19.03 Demonstrate how traits are inherited from plants to offspring.
19.04 Describe how genetic processes and structures control inheritance in plants.
19.05 Predict probable results of single or multiple trait crosses.

20.0 PERFORM PROPAGATION--The student will be able to:

20.01 Prepare a lab for use as a tissue culture facility.
20.02 Describe the effects of growth hormones on a plant produced by tissue culture.
20.03 Demonstrate the use of sterile instruments and materials.
20.04 Produce a crop of plants using tissue culture methods and prepare a written report of results.
20.05 Produce a crop of plants using another culture method and prepare a written report of results.

21.0 USE PLANTS TO SHOW NUTRIENT ABSORPTION AND THE TRANSLOCATION PROCESS IN PLANTS--The student will be able to:

21.01 Determine plant nutrient levels in each plant growth stage.
21.02 Test plant tissues to determine nutrients and minerals present in a variety of plants.
21.03 Demonstrate factors that affect the nutrient levels in plant tissue.
21.04 Compare and contrast osmosis and diffusion.

22.0 IDENTIFY, DETERMINE MODE OF ACTION, AND CONTROL PLANT PATHOGENS--The student will be able to:

22.01 Research and analyze economic loss due to disease and/or weed infestation.
22.02 Identify diseases caused by fungi.
22.03 Identify diseases caused by viruses.
22.04 Identify diseases caused by bacteria.
22.05 Identify vectors of diseases.
22.06 Demonstrate different techniques of controlling diseases and weeds.

23.0 DEMONSTRATE ALTERNATE METHODS OF PLANT PRODUCTION--The student will be able to:

23.01 Demonstrate different means of hydroponics production.
23.02 Determine the role of pH in hydroponics production.
23.03 Determine nutrient needs in hydroponics systems.
23.04 Describe crops grown commercially by hydroponics in your region.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Course Number: 8106810
Course Title: Agriscience Foundations I
Course Credit: 1

COURSE DESCRIPTION:

This course was developed as a core and is designed to develop competencies in the areas of agricultural history; global importance of agriculture; career opportunities; applied scientific and technological concepts; ecosystems; agricultural safety; principles of integrated pest management; principles of plant and animal growth; economic principles; agricultural marketing; and human relations skills.

01.0 DESCRIBE THE SOCIOECONOMIC ROLE OF THE AGRICULTURAL INDUSTRY--The student will be able to:

- 01.01 Prepare a report on the history of the agricultural industry.
- 01.02 Discuss the impact of agricultural products and services on the local, state, national, and global economy.
- 01.03 Investigate career opportunities in the agricultural industry and identify educational experiences necessary to prepare for those careers.
- 01.04 Discuss the role of the agricultural industry in the interaction of population, food, energy, and the environment.

02.0 APPLY SCIENTIFIC AND TECHNOLOGICAL PRINCIPLES TO THE AGRICULTURAL INDUSTRY--The student will be able to:

- 02.01 Discuss the importance of scientific classification in agriculture.
- 02.02 Use the scientific method to solve problems in agriculture.
- 02.03 Explain the use of genetics in agriculture, including probability applications.
- 02.04 Analyze the impact of recent technology on the agricultural industry.
- 02.05 Identify and describe the components of an ecosystem both biotic and abiotic.
- 02.06 Construct and analyze a diagram of a biological food web and subsequent food chains.
- 02.07 Describe and diagram the water, carbon, nitrogen, oxygen, sulfur, and phosphorus cycles.
- 02.08 Evaluate soil profiles, land-capability classes, and soil conservation practices.
- 02.09 List the components of Florida's fresh water systems (lakes, ground water, aquifer, sink holes, rivers, and swamps) and explain the importance of managing these resources.
- 02.10 Explain the interaction of one natural resource with another.

02.11 Describe the causes and effects of air, water, and land pollution and identify ways to prevent pollution.
02.12 Explain the flow of energy from the sun through agricultural systems.
02.13 Describe the environmental requirements necessary for a productive natural or man-made aquaculture system.
02.14 Apply principles of waste management to environmental problems common to agricultural systems.
02.15 Understand the concept of best management practices (BMP) as applied to agriculture.
02.16 Identify advances in biotechnology impacting agriculture such as transgenic crops and biological controls.
02.17 Identify computer technology advances such as Geographic Information Systems (GIS) and Global Positioning Systems (GPS).

03.0 PRACTICE AGRICULTURAL SAFETY--The student will be able to:

03.01 List the most common causes of agricultural accidents.
03.02 Discuss the importance of following proper safety precautions in the agricultural industry.
03.03 Demonstrate safety procedures in the classroom, laboratory, and workplace.
03.04 Describe symptoms of pesticide poisoning.
03.05 Extract pertinent information from a pesticide label and Material Safety Data Sheet (MSDS).
03.06 Select, mix, and apply a nonrestricted chemical, according to the label and according to Environmental Protection Agency (EPA), MSDS, and Worker Protection Standard regulations.
03.07 Clean and store pesticide application equipment, safety clothing, and safety equipment.
03.08 Identify the proper disposal of containers and residual pesticides.
03.09 Discuss the proper procedures of basic first aid and cardiopulmonary resuscitation (CPR).

04.0 DEMONSTRATE THE USE OF TOOLS, EQUIPMENT AND INSTRUMENTS IN THE AGRICULTURAL INDUSTRY--The student will be able to:

04.01 Choose the proper tools, equipment, and instruments for a specific job.
04.02 Describe the principles of selected mechanical applications (e.g. levers, pulleys, hydraulics, internal combustion).
04.03 Calibrate spray equipment; solve time, distance, area, volume ratio, proportion, and percentage problems in agriscience.
04.04 Demonstrate the ability to use an equipment manual.
04.05 Demonstrate the use of selected tools, equipment, and instruments.
04.06 Service, maintain, and store tools, equipment, instruments, and supplies.

05.0 DESCRIBE THE PRINCIPLES OF PEST MANAGEMENT --The student will be able to:

05.01 Identify types of pests and beneficials.

05.02 Identify and select an appropriate control for each type of pest and/or weed.
05.03 Describe the principles and benefits of integrated pest management.

06.0 DESCRIBE THE PRINCIPLES OF PLANT AND/OR ANIMAL NUTRIENT GROWTH AND REPRODUCTION--The student will be able to:

For plant:

06.01 Describe the structure functions of plant parts including roots, stems, leaves, and flowers.
06.02 Describe the processes of plant growth including photosynthesis, respiration and nutrient uptake.
06.03 Propagate plants through sexual and asexual means.
06.04 Identify the nutrients required for plant growth and development and the role of each.
06.05 Extract pertinent information from a fertilizer label.

For animal:

06.07 Identify the nutrients required for animal growth and development and the role of each.
06.08 Identify and describe the anatomical systems of animals and the functions of each, including major components.
06.09 Describe the process of animal reproduction.

07.0 APPLY BUSINESS SKILLS AND ECONOMIC PRINCIPLES TO THE AGRICULTURAL INDUSTRY--The student will be able to:

07.01 Explain the basic economic principles in the agricultural industry.
07.02 Explain the importance and impacts of local, state, and federal regulations and required documentation affecting the agricultural industry.
07.03 Describe the types of agribusiness by organizational structure (i.e. sole proprietorship, partnership, corporation, cooperatives).
07.04 Select and use computer applications.
07.05 Analyze and interpret agribusiness data.
07.06 Keep and maintain supervised agricultural experience (SAE) records.
07.07 Interpret legal descriptions of land.

08.0 EXPLAIN THE BASIC MARKETING PROCESSES IN THE AGRICULTURAL INDUSTRY--The student will be able to:

08.01 Describe key factors in marketing agricultural products.
08.02 Select agricultural products according to grades and standards.

09.0 DEMONSTRATE HUMAN-RELATIONS, COMMUNICATIONS, AND LEADERSHIP SKILLS--The student will be able to:

09.01 Demonstrate acceptable work habits and attitudes.

09.02 Correctly follow oral and written directions and ask questions that clarify directions, as needed.
09.03 Communicate effectively in verbal, written, and nonverbal modes.
09.04 Recognize and demonstrate good listening skills.
09.05 Conduct small informal and formal group meetings.
09.06 Identify the opportunities for leadership development available through an appropriate student and/or professional organization.
09.07 Recognize and demonstrate communications skills in the workplace.
09.08 Demonstrate effective telephone skills.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Course Number: 8106850
Course Title: Agricultural Biotechnology 2
Course Credit: 1

COURSE DESCRIPTION:

This course was developed as a core and is designed to develop competencies in the areas of agricultural biotechnology in agriculture, scientific investigation, laboratory safety, scientific and technological concepts; and the fundamentals of biotechnology.

10.0 DESCRIBE BIOTECHNOLOGY APPLICATIONS IN THE AGRICULTURAL INDUSTRY--The student will be able to:

- 10.01 Explain how biotechnology has impacted the production of agricultural goods.
- 10.02 Describe the importance of biotechnology in providing an adequate supply of food and fiber.
- 10.03 Explain how biotechnology has affected careers in agriculture.
- 10.04 Suggest possible biotechnology solutions to current agricultural problems.

11.0 CONDUCT SCIENTIFIC INVESTIGATION AND APPLY RESULTS--The student will be able to:

- 11.01 Describe the major steps of scientific inquiry (the scientific method).
- 11.02 Design an agricultural experiment using appropriate control measures.
- 11.03 Devise a system for recording data.
- 11.04 Prepare a report on the experiment conducted.
- 11.05 Plan and conduct follow-up experiments using the scientific method.
- 11.06 Discuss research being conducted in agriculture.
- 11.07 Assess the risks and benefits of agricultural technology to society.
- 11.08 Summarize data and draw appropriate conclusions.
- 11.09 Collect and record data using SI units.

12.0 DEMONSTRATE LEADERSHIP, EMPLOYABILITY, COMMUNICATION AND HUMAN RELATION SKILLS--The student will be able to:

- 12.01 Conduct group meetings using parliamentary procedure and public speaking skills.
- 12.02 Follow acceptable work habits and personal characteristics.
- 12.03 Follow acceptable employee hygiene habits.
- 12.04 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons.

12.05 Conduct a job search and identify advanced training opportunities and the requirements.
12.06 Demonstrate an understanding of team planning, problem solving and how communications processes and individuals contribute to the group.
12.07 Prepare a resume.
12.08 Work effectively as a team member.
12.09 Communicate well with others.
12.10 Present a written and an oral report.

13.0 PRACTICE AGRICULTURAL LABORATORY SAFETY--The student will be able to:

13.01 Identify first aid supplies, personnel and emergency protection areas.
13.02 Use appropriate safety procedures and guidelines.
13.03 Monitor, use, store and dispose of hazardous materials properly.
13.04 Understand and follow Material Safety Data Sheets (MSDS) and Occupational Safety and Health Administration (OSHA) standards.
13.05 Understand and utilize safety equipment.
13.06 Identify safety symbols and signs.

14.0 DEMONSTRATE PROPER USE OF AGRICULTURAL LABORATORY EQUIPMENT AND MATERIALS--The student will be able to:

14.01 Practice aseptic techniques.
14.02 Perform mathematical calculations and conversions.
14.03 Make stock reagents and solutions.
14.04 Monitor physical properties of a solution.
14.05 Sterilize and prepare equipment.
14.06 Make and dispense media.
14.07 Maintain reagent integrity.
14.08 Maintain inventory of laboratory supplies.
14.09 Use basic weighing and measuring techniques.
14.10 Perform basic separation techniques.
14.11 Handle and store biological materials.
14.12 Use specialized equipment in the laboratory.

15.0 DESCRIBE THE FUNDAMENTALS OF BIOTECHNOLOGY--The student will be able to:

15.01 Describe the cell as the basic unit of life.
15.02 Describe the importance of single-celled organisms to agriculture.
15.03 Explain how the knowledge of cells is important to agriculture.
15.04 Analyze the difference between plant cells and animal cells.
15.05 Explain the variations in different types of cells.
15.06 Describe cellular structure.
15.07 Give examples of agricultural uses of cellular structures.
15.08 Analyze the functions of various parts of cells.
15.09 Explain the Mendel Theory of Genetics.
15.10 Analyze a Punnett Square.
15.11 Discuss the make-up of chromosomes.
15.12 Discuss the process of DNA transfer.

15.13 Describe the relationship of cellular science and biotechnology.

16.0 INVESTIGATE THE USE OF BIOTECHNOLOGY IN PLANT AND/OR ANIMAL SCIENCE--The student will be able to:

For plant:

16.01 Explain how the inheritance of traits in plants is regulated.
16.02 Apply basic principles of plant genetics.
16.03 Describe the process of pollination in plants.
16.04 Explain how biotechnology is being used in combination with conventional plant breeding programs.
16.05 Determine the effects of moisture, temperature, oxygen, and light on seed germination.
16.06 Explain the major steps in the seed germination process.
16.07 Describe the role of enzymes and hormones in seed germination.
16.08 Explain the major steps in the seed germination process.
16.09 Apply basic micropropagation techniques.
16.10 Describe and examine the effects of plant growth regulators.
16.11 Describe the factors that affect nutrient levels contained in plant tissues.
16.12 Describe nutrient uptake and translocation processes.
16.13 Compare plant nutrient levels by stage growth.
16.14 Describe how herbicides work within plants to cause injury or death.
16.15 Explain the differential effects of herbicides.
16.16 Determine the influence of climatic conditions, plant characteristics, and application techniques on herbicide effectiveness.

For animal:

16.17 Discuss the interdependence of systems in an animal’s body.
16.18 Specify how genetic principles are used in animal breeding.
16.19 Explain how crossbred animals are developed.
16.20 Explain the steps involved in meiosis.
16.21 Explain the process of natural fertilization.
16.22 Explain alternate reproductive technologies.
16.23 Research career opportunities in animal science.
16.24 Analyze the factors influencing animal growth.
16.25 Explain the stages of animal growth.
16.26 Identify the prevalent diseases and parasites and their biological impact on animals.
16.27 Describe the proper methods of prevention and treatment of diseases and parasites that affect animals.
16.28 Research environmental issues affecting animal science.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Course Number: 8106510
Course Title: Plant Biotechnology 3
Course Credit: 1

COURSE DESCRIPTION:

This course is designed to develop competencies in the areas of biotechnology in plant science, plant classification, media and nutrient requirements of plants, genetic principles of plant production, propagation, and plant pathogens.

17.0 DESCRIBE PLANT CLASSIFICATIONS AND THE ECONOMIC IMPACT TO YOUR REGION--The student will be able to:

- 17.01 Identify all plant classifications and conditions and the economic impact to your region.
- 17.02 Identify at least thirty plants by common and scientific names.

18.0 DETERMINE ENVIRONMENTAL, MEDIA AND NUTRIENT NEEDS OF SELECTED PLANTS--The student will be able to:

- 18.01 Conduct plot research to determine optimum productivity.
- 18.02 Conduct experiments related to fertilization rates.
- 18.03 Prepare and present report on plant trial experiments.
- 18.04 Design a plant culture facility for commercial use.

19.0 APPLY GENETIC PRINCIPLES TO PLANT PRODUCTION--The student will be able to:

- 19.01 Describe the relationship between reproduction and plant improvement.
- 19.02 Demonstrate the reproductive cycle in seed plants.
- 19.03 Demonstrate how traits are inherited from plants to offspring.
- 19.04 Describe how genetic processes and structures control inheritance in plants.
- 19.05 Predict probable results of single or multiple trait crosses.

20.0 PERFORM PROPAGATION--The student will be able to:

- 20.01 Prepare a lab for use as a tissue culture facility.
- 20.02 Describe the effects of growth hormones on a plant produced by tissue culture.
- 20.03 Demonstrate the use of sterile instruments and materials.
- 20.04 Produce a crop of plants using tissue culture methods and prepare a written report of results.
- 20.05 Produce a crop of plants using another culture method and prepare a written report of results.

21.0 USE PLANTS TO SHOW NUTRIENT ABSORPTION AND THE TRANSLOCATION PROCESS IN PLANTS--The student will be able to:

21.01 Determine plant nutrient levels in each plant growth stage.
21.02 Test plant tissues to determine nutrients and minerals present in a variety of plants.
21.03 Demonstrate factors that affect the nutrient levels in plant tissue.
21.04 Compare and contrast osmosis and diffusion.

22.0 IDENTIFY, DETERMINE MODE OF ACTION, AND CONTROL PLANT PATHOGENS--The student will be able to:

22.01 Research and analyze economic loss due to disease and/or weed infestation.
22.02 Identify diseases caused by fungi.
22.03 Identify diseases caused by viruses.
22.04 Identify diseases caused by bacteria.
22.05 Identify vectors of diseases.
22.06 Demonstrate different techniques of controlling diseases and weeds.

23.0 DEMONSTRATE ALTERNATE METHODS OF PLANT PRODUCTION--The student will be able to:

23.01 Demonstrate different means of hydroponics production.
23.02 Determine the role of pH in hydroponics production.
23.03 Determine nutrient needs in hydroponics systems.
23.04 Describe crops grown commercially by hydroponics in your region.