

# Agricultural and Environmental Systems Career Field Agriculture, Food and Natural Resources

Subject Code: 010105

## Outcome & Competency Descriptions

### Course Description:

This first course in the career field is an introduction to Agricultural and Environmental Systems. Students will be introduced to the scope of the Agricultural and Environmental Systems career field. They will examine principles of food science, natural resource management, animal science & management, plant & horticultural science, power technology and bioscience. Students will examine the FFA organization and Supervised Agricultural Experience programs. Throughout the course, students will develop communication, leadership and business skills essential to the agriculture industry.

### Strand 1. Business Operations/21st Century Skills

Learners apply principles of economics, business management, marketing and employability in an entrepreneur, manager and employee role to the leadership, planning, developing and analyzing of business enterprises related to the career field.

### Outcome: 1.1. Employability Skills

Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

### Competencies

- 1.1.3. Develop a career plan that reflects career interests, pathways and secondary and postsecondary options.
- 1.1.4. Describe the role and function of professional organizations, industry associations and organized labor and use networking techniques to develop and maintain professional relationships.

*An "X" indicates that the pathway applies to the outcome.*

<b>Pathways</b>	X	Agribusiness & Production	X	Animal Science & Management	X	Bioscience	X	Natural Resource	X	Horticulture	X	Power Technology
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### Outcome: 1.2. Leadership and Communications

Process, maintain, evaluate and disseminate information in a business. Develop leadership and team building to promote collaboration.

### Competencies

- 1.2.1. Extract relevant, valid information from materials and cite sources of information.
- 1.2.2. Deliver formal and informal presentations.
- 1.2.5. Communicate information (e.g., directions, ideas, vision, workplace expectations) for an intended audience and purpose.
- 1.2.6. Use proper grammar and expression in all aspects of communication.
- 1.2.7. Use problem-solving and consensus-building techniques to draw conclusions and determine next steps.
- 1.2.13. Identify stakeholders and solicit their opinions.
- 1.2.14. Use motivational strategies to accomplish goals.

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**Outcome: 1.4. Knowledge Management and Information Technology**

Demonstrate current and emerging strategies and technologies used to collect, analyze, record and share information in business operations.

**Competencies**

- 1.4.1. Use office equipment to communicate (e.g., phone, radio equipment, fax machine, scanner, public address systems).
- 1.4.2. Select and use software applications to locate, record, analyze and present information (e.g., word processing, e-mail, spreadsheet, databases, presentation, Internet search engines).
- 1.4.4. Use system hardware to support software applications.
- 1.4.5. Use information technology tools to maintain, secure and monitor business records.
- 1.4.6. Use an electronic database to access and create business and technical information.

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**Outcome: 1.6. Business Literacy**

Develop foundational skills and knowledge in entrepreneurship, financial literacy and business operations.

**Competencies**

- 1.6.1. Identify business opportunities.
- 1.6.2. Assess the reality of becoming an entrepreneur, including advantages and disadvantages (e.g., risk versus reward, reasons for success and failure).
- 1.6.3. Explain the importance of planning your business.
- 1.6.4. Identify types of businesses, ownership and entities (i.e., individual proprietorships, partnerships, corporations, cooperatives, public, private, profit, not-for-profit).
- 1.6.11. Describe how all business activities of an organization work within the parameters of a budget.

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**Outcome: 1.7. Entrepreneurship/Entrepreneurs**

Analyze the environment in which a business operates and the economic factors and opportunities associated with self-employment.

**Competencies**

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1.7.7. Create a list of personal strengths, weaknesses, skills and abilities needed to be successful as an entrepreneur.

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**Outcome: 1.8. Operations Management**

Plan, organize and monitor an organization or department to maximize contribution to organizational goals and objectives.

**Competencies**

- 1.8.2. Select and organize resources to develop a product or a service.
- 1.8.3. Analyze the performance of organizational activities and reallocate resources to achieve established goals.
- 1.8.9. Develop a budget that reflects the strategies and goals of the organization.

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**Outcome: 1.9. Financial Management**

Use financial tools, strategies and systems to develop, monitor and control the use of financial resources to ensure personal and business financial well-being.

**Competencies**

- 1.9.1. Create, analyze and interpret financial documents (e.g., budgets, income statements).
- 1.9.3. Review and summarize savings, investment strategies and purchasing options (e.g., cash, lease, finance, stocks, bonds).
- 1.9.8. Identify income sources and expenditures.

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**Outcome: 1.11. Principles of Business Economics**

Examine and employ economic principles, concepts and policies to accomplish organizational goals and objectives.

**Competencies**

- 1.11.1. Identify the economic principles that guide geographic location of an industry's facilities (e.g., relative scarcity, price, quantity of products and services).

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**Outcome: 1.12. Site and Personal Safety Procedures**

Follow site and personal safety procedures in specific situations with specialized tools and equipment, evaluate the situation and take corrective action.

**Competencies**

- 1.12.1. Use Occupational Safety and Health Administration (OSHA) defined procedures for identifying employer and employee responsibilities, working in confined spaces, managing worker safety programs, using ground fault circuit interrupters (GFCIs), maintaining clearance and boundaries and labeling.
- 1.12.2. Interpret safety signs and symbols.
- 1.12.5. Identify the location of emergency flush showers, eyewash fountains, Safety Data Sheets (SDSs), fire alarms and exits.
- 1.12.6. Identify procedures for the handling, storage and disposal of hazardous materials.
- 1.12.7. Select, use, store, maintain and dispose of personal protective equipment (PPE), appropriate to job tasks, conditions and materials.
- 1.12.8. Identify safety hazards and take corrective measures.
- 1.12.9. Identify, inspect and use safety equipment appropriate for the task.
- 1.12.10. Follow established procedures for the administration of first aid and contact emergency medical personnel when necessary.

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**Strand 2. Animal Science**

Learners apply principles of animal anatomy, physiology, genetics, behavior and nutrition to the research and development, selection and reproduction, health and management of animals in domestic and natural environments.

**Outcome: 2.3. Care and Management**

Apply animal care and management procedures to ensure animal husbandry and welfare, including managing environmental conditions to ensure animal health and performance.

**Competencies**

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- 2.3.1. Identify species-specific terminology based on gender and age.
- 2.3.2. Identify, classify, evaluate and select animal species or breeds for a desired outcome.

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### Strand 3. Biotechnology

Learners apply the skills and knowledge of interpreting laboratory requests, using protective clothing and hazardous material containment, specimen collection procedures, a variety of laboratory testing and techniques, and maintenance of laboratory equipment and supplies.

#### Outcome: 3.1. Handling, Preparation, Storage and Disposal

Handle, prepare, transport, store and dispose of specimens using procedures that minimize disturbance to the test specimen. Monitor, record and maintain the integrity of equipment and instrumentation, environmental conditions of the facility and the inventory.

#### Competencies

- 3.1.7. Select personal protective attire for various laboratory protocols.

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#### Outcome: 3.4. Molecular-Genetics Technology

Apply knowledge of nucleic acid structure and function, deoxyribonucleic acid (DNA) replication, transcription, translation, chromosome structure and remodeling and regulation of gene expression in prokaryotes and eukaryotes.

#### Competencies

- 3.4.1. Use a Punnet square to predict and explain Mendel's Laws, genotype and phenotype.

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#### Outcome: 3.6. Culturing

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Perform experimental techniques used in microbial biology to study cell growth, manipulation and evaluation.

### Competencies

3.6.1. Identify the structure of cells and the functions of their components.

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### Strand 4. Power Systems

Learners apply principles of tool use, power transmission, hydraulics, two- and four-stroke cycle combustion, heating and cooling, exhaust, ignition, starting and charging, steering and lubrication systems to operate, to maintain or repair equipment.

#### Outcome: 4.1. Tool, Stationary and Mobile Equipment Maintenance

Inspect, clean, maintain and perform planned preventative maintenance on tools, machinery, implements and equipment.

### Competencies

4.1.1. Identify the types of hand tools, power tools and stationary equipment and describe their functions.

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#### Outcome: 4.3. Engines

Apply concepts to service components of both small and large internal combustion engines.

### Competencies

4.3.5. Compare and contrast two-cycle and four-cycle engines and their operating principles.

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### Strand 5. Structural Engineering

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## Outcome & Competency Descriptions

Learners apply the principles of engineering related to electricity, structural repair and design, use of brick, block and concrete, water distribution, and metal working to design, construct, manage and maintain structures and biological systems used in agriculture, food and natural resources.

**Outcome: 5.3. Design and Estimate**

Plan and design a basic site plan for a desired outcome.

**Competencies**

- 5.3.1. Identify, interpret and use symbols, lines, dimensions, views, sections, site plans, floor plans, specifications, common scales, detail drawings and abbreviations on drawings and prints.
- 5.3.2. Apply proportional reasoning and indirect measurement techniques.

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**Outcome: 5.6. Construction**

Follow architectural plans to construct and repair simple outdoor structures and minor building additions.

**Competencies**

- 5.6.2. Lay out, cut, smooth, shape and bore construction materials.

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**Outcome: 5.10. Joining and Cutting Metals with Heat**

Join and cut steel using heat in horizontal and vertical positions.

**Competencies**

- 5.10.3. Compare and contrast metal welding operating characteristics and performance, (e.g., oxy-fuel, shielded metal arc, gas tungsten arc, braising, soldering).

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**Strand 6. Environmental Science**

Learners apply earth, life, and physical sciences to the production, extraction, processing, protection, use, and renewal of both renewable and non-renewable resources.

**Outcome: 6.1. Soils**

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Apply knowledge of soil characteristics and soil information resources to overcome any existing soil use limitations while maintaining or improving soil quality.

### Competencies

- 6.1.1. Identify soil forming factors and explain how they produce variability in soils.
- 6.1.3. Collect, test and analyze soil samples for physical and chemical properties.

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### Outcome: 6.2. Water Quality

Analyze, interpret, and manage the biological, chemical and physical properties of water quality.

### Competencies

- 6.2.1. Assess and explain the interactions between human activities and the Earth's hydrosphere (e.g., septic systems, desalinization, point and non-point source pollution).

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### Outcome: 6.11. Habitat Management and Restoration

Develop a plan for the management and restoration of a specific habitat.

### Competencies

- 6.11.1. Differentiate the properties and characteristics of habitats.
- 6.11.2. Examine sites and place them into ecological classifications.
- 6.11.3. Explain the impacts of an increasing human population on habitats.

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**Strand 7. Food Science**

Learners apply principles of biology, chemistry and physics to the research, development, production, processing and distribution of food products meeting quality assurance standards in a system that is safe and secure.

**Outcome: 7.2. Quality Assurance**

Inspect the food production process, locate potential sources of food quality and safety deviations in facilities and prepare a corrective action plan.

**Competencies**

7.2.2. Describe the internal and external quality attributes that a food product should possess.

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**Outcome: 7.5. Food Product Development**

Apply principles of nutrition and human behavior to create a new food prototype that meets a specific dietary need or demand for consumption, design packaging and seek label approval.

**Competencies**

7.5.1. Conduct a sensory evaluation of food products.

7.5.4. Calculate nutrient values, serving sizes and nutrient variability for a food product.

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**Strand 8. Plant Science**

Learners apply principles of plant anatomy, physiology, nutrition and genetics to the research and development, selection and reproduction, planting, fertilization, health, harvesting and management of plants in a domestic and/or natural environment.

**Outcome: 8.1. Plant Nutrition**

Select and apply macronutrients and micronutrients based on deficiencies identified using testing application methods and optimum management that account for environmental factors.

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### Competencies

8.1.3. Determine the nutrient requirements of plants.

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### Outcome: 8.4. Growth and Management

Manage and manipulate plant development through the selection, planting and growing of seeds and plants, based on global demand, economic importance and growing conditions.

### Competencies

8.4.1. Identify and classify plants using taxonomy.

8.4.4. Explain requirements necessary for photosynthesis to occur and identify the products and byproducts of photosynthesis.

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### Strand 9. Energy

Learners apply principles of physics, chemistry, the earth sciences and mathematics to energy sources, transformations, acquisition, and application.

### Outcome: 9.1. Energy

Identify energy sources according to their economic viability, sustainability and environmental impact.

### Competencies

9.1.1. Identify, compare and contrast fossil fuel sources and the technology used to generate energy.

9.1.2. Identify, compare and contrast renewable energy sources and the technology used to generate energy.

9.1.3. Identify, compare, and contrast alternative energy sources and technology used to generate energy (e.g., fuel cells, hydrogen, nuclear).

9.1.4. Identify the social, economic and environmental drivers and barriers that influence the development and use of energy sources.

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