# Agricultural and Environmental Systems Career Field

## Forestry and Woodland Ecosystems

**Subject Code: 010730**

**Course and Unit Descriptions**

**Course Description**:

Students will apply principles of botany, dendrology, and silviculture to the management of forests and forest ecosystems. They will apply principles of timber cruising with surveying and mapping techniques to take forest measurements. Learners will develop the knowledge and skills necessary for forest reforestation, timber stand improvement, timber harvesting, and forest product utilization. Learners will operate and maintain forestry equipment, apply fire management practices, and understand related regulations, laws, and policy issues.

**Unit: Safety**

Students will learn safety procedures with basic tools and equipment. Students will evaluate work environment and follow safety procedures with tools and equipment.

**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.

**Competency:**

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.

1.12.6 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.

1.12.12 Apply inspection, rejection criteria, hitch configurations, and load handling practices to slings and rigging hardware.

1.12.13 Demonstrate the proper use of American National Standards Institute (ANSI) hand signals.

**Outcome 6.8**

Contaminants and Pollution Control: Assess an affected area, determine the source and type of contaminant, and respond.

**Competency:**

6.8.6 Identify, comply with, and implement best management practices for contaminant control, remediation, and prevention (e.g., biological, sanitation, buffer strips).

6.8.7       Identify, describe, and recommend remediation strategies for a release of contaminant to soil, surface water, or groundwater.

6.8.10 Identify and describe requirements to develop and implement various emergency response plans.

6.8.11 Identify and contact local emergency response teams.

6.8.12 Analyze environmental conditions that influence environmental response.

**Unit: Dendrology, Silviculture, and Reforestation**

Students will learn the physical, biological, and chemical properties of soils and other plant growing media. Students will identify ecosystems along with inventorying and evaluating specific ecosystems. Students will select, apply, and evaluate the effects of macronutrients on plants along with identifying deficiencies found in the plants and the soil. Students will apply management skills to propagate plants, to control pest management, and manage plant production.

**Outcome 6.1**

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

**Competency:**

6.1.9 Evaluate soil survey data and implement management decisions.

**Outcome 6.10**

Ecosystems: Evaluate biotic and abiotic components and relationships in ecosystems to apply restoration and conservation practices that maintain functionality.

**Competency:**

6.10.1 Describe ecological levels, including population, community, ecosystem, biome, and biosphere.

6.10.2 Distinguish the flow of energy through ecosystems.

6.10.3 Identify and classify interactions among organisms, including predation, symbiosis, and competition, to determine species interdependent relationships.

6.10.4 Describe the process of succession and its impact on ecosystems.

6.10.5 Connect biotic interactions with the abiotic environment.

6.10.9 Identify and describe the impacts of native, non-native, and invasive species on ecosystems.

**Outcome 8.1.**

Plant Nutrition: Select and apply macronutrients and micronutrients based on deficiencies identified from the use of industry-driven testing and application methods and optimum management that account for environmental factors.

**Competency:**

8.1.6 Analyze and draw conclusions from soil and plant tissue test data and determine management recommendations for increasing production, increasing profitability, enhancing environmental protections, and improving sustainability.

8.1.7 Distinguish between biotic and abiotic factors (e.g., soil types, minerals, pH, microorganisms) that influence and optimize the availability of nutrients for plants.

**Outcome 8.2**

Plant Reproduction: Propagate and cultivate plants for specific characteristics under a variety of production systems.

**Competency:**

8.2.1 Identify the reproductive anatomy of plants and describe their physiological functions.

8.2.2 Describe how biotic and abiotic factors (e.g., insects, light, temperature, microorganisms, moisture, location) influence plant reproduction.

8.2.3 Compare and contrast variations of plant reproductive systems among plant species.

**Outcome 8.3**

Pest Management: Develop and implement an integrated pest management (IPM) plan by scouting and identifying specific plant pests and the damage they cause and apply specialized control methods.

**Competency:**

8.3.1 Identify and classify insects, weeds, pathogens, animal pests, and describe the damages they cause.

8.3.2 Examine the interrelationships of the disease triangle among host, pathogen, and environment.

8.3.3 Analyze and calculate the economic threshold of pest damage.

8.3.4 Determine the components of an integrated pest management plan and related safety practices.

8.3.5 Describe native and transgenic adaptations and modifications that have led to plant tolerance or resistance to fungal, bacteria and insect pests.

8.3.6. Describe the types and functions of biological, mechanical, and chemical control methods.

8.3.7 Develop an IPM plan, based on pest life cycles, available treatments, application methods and the impact on the environment (e.g. drift, application rate, and long term soil health).

**Outcome 8.4**

Growth and Management: Explain, manage, and manipulate plants through all stages of growth and development.

**Competency:**

8.4.1 Identify and classify plants using taxonomy.

8.4.2 Identify plant anatomical structures and their function.

8.4.3 Identify and classify seeds.

8.4.4 Identify and classify plants and describe management decisions at all stages.

8.4.5 Explain requirements of photosynthesis and identify the products and byproducts..

8.4.6 Explain the process and importance of transpiration in plant growth and development.

8.4.7 Understand aerobic respiration and its relationship to plant growth and management.

8.4.8 Explain primary and secondary plant growth..

8.4.9 Identify the plant responses to plant growth regulators and different forms of tropism.

8.4.10. Understand environmental and artificial factors that influence plant germination, growth, and development.

8.4.11 Select, evaluate, and prepare soil or media for planting.

8.4.12 Understand and evaluate the process by which plants are selected in relation to production use.

8.4.13 Evaluate and implement planting practices.

8.4.15. Evaluate and implement transplanting practices.

8.4.16 Control plant growth through mechanical and chemical means..

8.4.19 Identify and describe production practices that lead to plant resistance and tolerance.

8.4.20 Compare and contract management practices in controlled and natural growing environments.

8.4.21 Distinguish between biotic and abiotic factors that influence plant stress.

**Unit: Measuring and Timber Harvesting**

Students will evaluate soils for properties suitable for growing timber for production. Students will learn how to handle, harvest, and store their timber products.

**Outcome 6.1**

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

**Competency:**

6.1.4 Identify factors (e.g., climate, , soil texture, mineralogy, soil organisms, drainage co-efficient, land use, vegetation types, and management practices) affecting organic matter and its function in soil quality.

6.1.6 Identify and describe soil conservation practices to reduce soil erosion and compaction.

6.1.8 Describe soil limitations in agronomic, urban, and natural resource practices.

6.1.9 Evaluate soil survey data and implement management decisions.

**Outcome 8.5**

Harvesting: Describe and implement harvesting methods.

**Competency:**

8.5.1 Determine crop readiness for salability and environmental conditions that can impact crop quality at harvest.

8.5.2 Describe safety precautions to take when harvesting.

8.5.3 Evaluate techniques to maximize yield through mechanical or hand harvesting methods.

8.5.4 Calculate and evaluate potential yield and loss due to harvesting.

8.5.5 Evaluate the impact of harvest techniques on the quality of plants and plant products.

8.5.6 Identify and implement harvesting methods and harvesting equipment.

8.5.7 Implement management practices to reduce loss.

**Outcome 8.6**

Handling and Storage: Handle and store plants and plant products to maximize quality and longevity.

**Competency:**

8.6.1 Describe safety precautions in handling and storage practices.

8.6.2 Explain, monitor, and manipulate conditions for optimal handling and storage of plants and plant products.

8.6.3 Calculate potential yield and loss due to processing and storage.

8.6.5. Identify storage methods and storage capacity for plants and plant products.

8.6.7 Implement and evaluate techniques for grading, handling, blending, segregating, packaging, and loading plants and plant products for distribution or transportation.

**Unit: Mapping and GIS**

Students will learn how to interpret maps and topographic site plans using surveying equipment to construct a basic site plan. Students will use GIS to interpret and produce maps.

**Outcome 5.4**

Surveying and Mapping: Perform surveying procedures to construct a site plan.

**Competency:**

5.4.1 Identify civil drafting symbols and abbreviations.

5.4.2 Interpret maps, topographic site plans, deeds, and aerial or satellite imagery for site planning.

5.4.3 Perform site measurements.

5.4.4 Integrate map and surveying data into geographic information system (GIS) or computer aided design (CAD) software.

5.4.5 Identify topographical and existing features of areas, including property lines, benchmarks, utilities, streets, and setbacks, on survey maps, parcel maps, and plats.

**Outcome 5.5**

Geographic Information Systems (GIS):Employ GIS computer applications to interpret data, maps, and land use.

**Competency:**

5.5.1 Interpret and evaluate the accuracy of digital imagery and aerial photography.

5.5.2 Explain map projections and the use of scales.

5.5.3 Describe GIS data structures (e.g., vector, grid, triangulated irregular network [TIN]).

5.5.8 Determine one’s position on the earth using GPS.

5.5.9 Integrate GPS data into GIS applications.

**Unit: Forest Pests and Diseases**

Students will identify forest ecosystems and their components. Students will identify the common types of plant pests and levels of controlling methods.

**Outcome 6.10**

Ecosystems: Evaluate biotic and abiotic components and relationships in ecosystems to apply restoration and conservation practices that maintain functionality.

**Competency:**

6.10.9 Determine the Identify and describe the impacts of native, non-native, and invasive species on ecosystems.

**Outcome 8.3**

Pest Management: Develop and implement an integrated pest management (IPM) plan by scouting and identifying specific plant pests and the damage they cause and apply specialized control methods.

**Competency:**

8.3.1 Identify and classify insects, weeds, pathogens, animal pests, and describe the damages they cause.

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8.3.3 Analyze and calculate the economic threshold of pest damage.

8.3.4 Determine the components of an integrated pest management plan and related safety practices.

8.3.5 Describe native and transgenic adaptations and modifications that have led to plant tolerance or resistance to fungal, bacteria, and insect pests.

8.3.7 Develop an IPM plan, based on pest life cycles, available treatments, application methods, and the impact on the environment (e.g. drift, application rate, and long term soil health).

**Unit: Equipment Operation and Maintenance**

Students will learn to inspect and provide maintenance to basic machinery and equipment. Students will learn how to safely inspect and calibrate specialized equipment needed for forestry production.

**Outcome 4.1.**

Tool, Stationary, and Mobile Equipment Maintenance: Inspect, clean, maintain, and perform preventative maintenance on equipment.

**Competency:**

4.1.1 Inspect, clean, maintain, and perform preventative maintenance on equipment.

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

4.1.3. Ensure the presence and functionality of safety equipment.

4.1.4. Identify potential hazards and limitations related to the use of equipment.

4.1.5. Maintain organization, and cleanliness of facilities, machinery, equipment, and tools for safety and appearance.

4.1.6. Inspect and service the electrical systems and components.

4.1.7. Inspect for fluid leakage, fluid levels, and the condition of fluids.

4.1.8. Inspect, clean, lubricate, and adjust equipment for safe operation.

4.1.9. Select fluids, maintain fluid levels, and replace system filters per OEM (original equipment manufacturer) specification.

4.1.10. Inspect and maintain fluid conveyance and storage components.

4.1.11. Identify and maintain accuracy of tooling, machinery, and equipment when performing preventive maintenance and repairs.

4.1.12. Compare alternative sources of power for equipment.

**Outcome 4.2**

Equipment Operations: Operate and maintain mechanical equipment and power systems.

**Competency:**

4.2.1 Follow OEM (original equipment manufacturer) recommended operating procedures and adjustment specifications as found in the operator manual.

4.2.2 Differentiate among the functions, limitations and proper use of equipment, equipment controls, and instrumentation.

4.2.3 Perform pre- and post-operation inspections and adjustments and report malfunctions.

4.2.4 Perform appropriate start-up, operating, and shut-down procedures.

4.2.5 Select and operate the equipment and attachments needed to complete the task per the OEM (original equipment manufacturer) operator manual.

**Unit: Forest Products**

Students will use marketing strategies to promote the forest industry and its products. Students will learn customer service and use its applications to work with their customers and foster positive working relationships.

**Outcome 1.3**

Business Ethics and Law: Analyze how professional, ethical, and legal behavior contributes to continuous improvement in organizational performance and regulatory compliance.

**Competency:**

1.3.1 Analyze how regulatory compliance (e.g., United States Department of Agriculture [USDA], Food and Drug Administration [FDA], United States Department of Interior [USDI], Ohio Livestock Care Standards, water quality standards, local water regulations, building codes) affects business operations and organizational performance.

**Outcome 1.6**

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

**Competency:**

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

1.6.6 Identify the target market served by the organization, the niche that the organization fills, and an outlook of the industry.

1.6.7 Identify the effect of supply and demand on products and services.

**Outcome 1.10**

Sales and Marketing: Manage pricing, place, promotion, packaging, positioning, and public relations to improve quality customer service.

**Competency:**

1.10.2 Determine the customer's needs and identify solutions.

1.10.5 Monitor customer expectations and determine product/service satisfaction by using measurement tools.

1.10.6 Discuss the importance of correct pricing to support a product’s or service’s positioning in the marketing mix.

1.10.7 Describe the importance and diversity of distribution channels (i.e., direct, indirect) to sell a product.

**Unit: Business Leadership & Employability Skills**

Students will develop critical thinking and problem-solving skills through the use of a variety of practical scenarios. Students will demonstrate leadership skills through participation with peer groups, support services, and professional organizations.

**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.

**Competency:**

1.1.1 Identify the knowledge, skills, and abilities necessary to succeed in careers.

1.1.2 Identify the scope of career opportunities and the requirements for education, training, certification, licensure, and experience.

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.

1.1.6 Explain the importance of work ethic, accountability, and responsibility, and demonstrate associated behaviors in fulfilling personal, community, and workplace roles.

1.1.7 Apply problem-solving and critical-thinking skills to work-related issues when making decisions and formulating solutions.

**Outcome 1.2**

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

**Competency:**

1.2.1 Extract relevant, valid information from materials, and cite sources of information.

1.2.3 Identify and use verbal, nonverbal, and active listening skills to communicate effectively.

1.2.5 Communicate information (e.g., directions, ideas, vision, workplace expectations) for an intended audience and purpose.

1.2.12 Use technical writing skills to complete forms and create reports.

1.2.13 Identify stakeholders and solicit their opinions.

**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.

**Competency:**

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).

1.4.3 Verify compliance with security rules, regulations, and codes (e.g., property, privacy, access, accuracy issues, client, and patient record confidentiality) pertaining to technology specific to the industry pathway.