**Course Description:**

Students will learn methods for establishing and managing landscapes to promote growth and balance. The classification and care of woody and herbaceous landscape plants will be learned. Students will learn to optimize growing conditions, balance nutrients, and manage pests and disease. They will apply proper planting, fertilizing, and pruning techniques while safely operating well maintained specialized equipment. Throughout the course, students will assess implications of landscape installation on the environment, and employ communication, business, and management strategies.

**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**

1.1.1. 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.

1.1.5. Develop strategies for self-promotion in the hiring process (e.g., filling out job applications, resumé writing, interviewing skills, portfolio development).

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.

1.1.8. Identify the correlation between emotions, behavior and appearance and manage those to establish and maintain professionalism.

1.1.9. Give and receive constructive feedback to improve work habits.

1.1.10. Adapt personal coping skills to adjust to taxing workplace demands.

1.1.11. Recognize different cultural beliefs and practices in the workplace and demonstrate respect for them.

1.1.12. Identify healthy lifestyles that reduce the risk of chronic disease, unsafe habits and abusive behavior.

**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.

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

1.2.4. Use negotiation and conflict-resolution skills to reach solutions.

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.

1.2.8. Identify the strengths, weaknesses and characteristics of leadership styles that influence internal and external workplace relationships.

1.2.9. Identify advantages and disadvantages involving digital and/or electronic communications (e.g., common content for large audience, control of tone, speed, cost, lack of non-verbal cues, potential for forwarding information, longevity).

1.2.10. Use interpersonal skills to provide group leadership, promote collaboration, and work in a team.

1.2.11. Write professional correspondence, documents, job applications and resumés.

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

1.2.13. Identify stakeholders and solicit their opinions.

1.2.14. Use motivational strategies to accomplish goals.

**Outcome: 1.3. Business Ethics and Law**

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

**Competencies**

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: 1.4. 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).

1.4.3. 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.

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.

1.4.7. Use personal information management and productivity applications to optimize assigned tasks (e.g., lists, calendars, address books).

1.4.8. Use electronic media to communicate and follow network etiquette guidelines.

**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.

1.6.5. Describe organizational structure, chain of command, the roles and responsibilities of the organizational departments and interdepartmental interactions.

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.

1.6.8. Identify the features and benefits that make an organization’s product or service competitive.

1.6.9. Explain how the performance of an employee, a department and an organization is assessed.

1.6.11. Describe how all business activities of an organization work within the parameters of a budget.

**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.

1.8.5. Use inventory and control systems to purchase materials, supplies and equipment (e.g., Last In, First Out [LIFO]; First In, First Out [FIFO]; Just in Time [JIT]; LEAN).

1.8.6. Identify the advantages and disadvantages of carrying cost and Just-in-Time (JIT) production systems and the effects of maintaining inventory (e.g., perishable, shrinkage, insurance) on profitability.

**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).

**Outcome: 1.10. Sales and Marketing**

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

**Competencies**

1.10.1. Identify how the roles of sales, advertising and public relations contribute to a company’s brand.

1.10.2. Determine the customer's needs and identify solutions.

1.10.3. Communicate features, benefits and warranties of a product or service to the customer.

1.10.4. Identify the company policies and procedures for initiating product and service improvements.

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.

**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.

1.12.4. Describe how working under the influence of drugs and alcohol increases the risk of accident, lowers productivity, raises insurance costs and reduces profits.

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.

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

1.12.15. Select and operate fire extinguishers based on the class of fire.

*An “X” indicates that the pathway applies to the outcome.*

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| **Pathways** |  | Agribusiness and Production Systems |  | Animal Science and Management |  | Bioscience | | X | Horticulture |
|  | Natural Resource Management |  | Power Technology | |  |  | | |
| **Green Practices** |  | Green-specific |  | Context-dependent | |  | Does not apply | | |

**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.

4.1.2. Ensure the presence and functionality of safety systems and hardware.

4.1.3. Identify potential hazards and limitations related to the use of hand tools, power tools and stationary equipment.

4.1.4. Maintain machinery, equipment, instrument and facility cleanliness, appearance and safety.

4.1.5. Inspect and service the electrical connections and lamps.

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

4.1.7. Clean, lubricate and adjust machinery and equipment.

4.1.8. Select fluids, maintain fluid levels and replace system filters.

4.1.9. Inspect and maintain fluid conveyance and storage components (e.g., hoses and lines, valves, nozzles).

4.1.10. Inspect and replace drive belts.

4.1.11. Calibrate metering, monitoring and sensing equipment.

**Outcome: 4.2. Equipment Operations**

Operate and maintain mechanical equipment and power systems.

**Competencies**

4.2.1. Follow manufacturer’s recommended operating procedures and adjustment specifications.

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 including levers, pedals or valves.

**Outcome: 4.3. Engines**

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

**Competencies**

4.3.1. Assess the physical and mechanical principles of engine operation, including motion, friction and thermodynamics.

4.3.3. Locate the name plate and determine engine specifications.

4.3.4. Analyze, evaluate and troubleshoot an engine.

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

4.3.6. Evaluate engine head and engine block components to determine serviceability according to the manufacturer’s specifications.

4.3.7. Remove and replace components comprising the engine block and engine head.

4.3.8. Employ the requirements for engine servicing to maintain emission requirements.

**Outcome: 4.4. Lubrication and Cooling Systems**

Inspect lubrication and cooling systems operation.

**Competencies**

4.4.1. Explain principles of engine lubrication and cooling.

**Outcome: 4.5. Fuel, Air Induction and Exhaust System**

Diagnose and repair fuel, air induction and exhaust systems.

**Competencies**

4.5.2. Identify conditions of hot or cold no starting, hard starting, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, fuel consumption rate, dieseling and emissions problems.

4.5.3. Check fuel for contaminants and quality.

*An “X” indicates that the pathway applies to the outcome.*

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| **Pathways** |  | Agribusiness and Production Systems |  | Animal Science and Management |  | Bioscience | | | X | Horticulture |
|  | Natural Resource Management |  | Power Technology | | |  |  | | |
| **Green Practices** |  | Green-specific |  | Context-dependent | | |  | Does not apply | | |

**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**

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

**Competencies**

6.1.2. Describe the relationship among physical properties of soils.

6.1.5. Determine land use and identify land capabilities classes.

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: 6.8. Contaminants and Pollution Control**

Assess an affected area, determine the source and type of contaminant and respond.

**Competencies**

6.8.2. Determine the types, sources and impact of natural and man-made contaminants.

6.8.3. Monitor, analyze and quantify levels of contaminants from point and non-point sources.

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

**Outcome: 6.10. Ecosystems**

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

**Competencies**

6.10.5. Connect biotic interactions with the abiotic environment.

6.10.7. Identify interactions of ecosystems to differentiate biomes.

6.10.8. Select and implement restoration ecology practices to repair damaged ecosystems.

6.10.9. Determine the impact of native and non-native invasive species on ecosystems.

*An “X” indicates that the pathway applies to the outcome.*

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| **Pathways** |  | Agribusiness and Production Systems |  | Animal Science and Management |  | Bioscience | | | X | Horticulture |
|  | Natural Resource Management |  | Power Technology | | |  |  | | |
| **Green Practices** |  | Green-specific |  | Context-dependent | | |  | Does not apply | | |

**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.

**Competencies**

8.1.1. Compare and contrast organic and inorganic sources of macronutrients and micronutrients.

8.1.2. Describe the functions of macronutrients and micronutrients in plants and the role that microorganisms play in plant nutrition.

8.1.3. Determine the nutrient requirements of plants.

8.1.4. Identify symptoms and causes of plant nutrient deficiencies and toxicities.

8.1.5. Collect soil and plant tissue for testing and analysis.

8.1.6. Analyze and draw conclusions from soil and plant tissue test data.

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

8.1.8. Calculate nutrient requirements and select nutrient sources and additives for optimum economic return.

8.1.9. Determine the nutrient content of organic and inorganic fertilizers.

8.1.10. Select the methods and time of nutrient application and apply nutrients.

**Outcome: 8.2. Plant Reproduction**

Propagate and cultivate plants for specific characteristics and economic variables for both greenhouses and crops.

**Competencies**

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

8.2.4. Select seeds and seed stock for desired traits.

**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.

**Competencies**

8.3.1. Identify and classify insect, weed, disease and animal pests.

8.3.2. Examine the interrelationships among plants, pests, humans and the environment.

8.3.3. Analyze and calculate the economic threshold of pest damage.

8.3.4. Determine and implement pest management safety practices (e.g., safety data sheets [SDSs], United States Environmental Protection Agency [EPA], United States Occupational Safety and Health Administration [OSHA], personal protective equipment [PPE], worker protection standards [WPS], refuge management strategy).

8.3.5. Evaluate the effectiveness of a pest management plan.

8.3.7. Describe the types and functions of biological and mechanical control methods.

8.3.8. Describe the types and functions of chemical pesticide control measures.

8.3.9. Develop an IPM plan, based on pest life cycles, available treatments, application methods and the impact on the environment.

8.3.10. Select application methods and implement an IPM plan.

8.3.11. Evaluate IPM plans and applications for their impact on the environment and their effectiveness.

**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.

8.4.2. Identify plant anatomical structures and tissues.

8.4.3. Identify and classify seeds and plants at all stages of growth.

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

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

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

8.4.17. Recognize plant disease symptoms, prevention, avoidance and treatments.

**Outcome: 8.5. Harvesting**

Evaluate and implement harvesting methods to maximize yield.

**Competencies**

8.5.1. Identify characteristics of grains, seeds, vegetables, fruits and ornamental plants that indicate crop maturity.

8.5.2. Describe safety precautions to take when harvesting.

8.5.3. Adjust to environmental conditions to enhance the harvesting of plant products.

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

8.5.5. Calculate potential yield and loss due to harvesting.

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

8.5.7. Identify harvesting methods and harvesting equipment.

**Outcome: 8.6. Handling and Storage**

Handle and store plants and plant products to maximize quality.

**Competencies**

8.6.1. Describe safety precautions in handling and storage practices.

8.6.2. Adjust to environmental conditions to enhance the handling and storage of plant products.

8.6.3. Apply harvesting, handling and storage techniques to minimize loss and maximize economic return.

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

8.6.5. Explain the proper conditions to maintain the quality of plants and plant products held in storage.

8.6.6. Maintain and enhance the quality of plant products through the manipulation of handling and storage techniques (e.g., temperature, humidity, retardants, light, chemicals, contamination).

8.6.7. Prepare products for sale, transportation and storage.

8.6.8. Identify storage methods for plants and plant products.

8.6.9. Monitor environmental conditions in storage facilities for plants and plant products.

*An “X” indicates that the pathway applies to the outcome.*

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| **Pathways** |  | Agribusiness and Production Systems |  | Animal Science and Management |  | Bioscience | | | X | Horticulture |
|  | Natural Resource Management |  | Power Technology | | |  |  | | |
| **Green Practices** |  | Green-specific |  | Context-dependent | | |  | Does not apply | | |