**Course Description:**

Students will learn skills in creating blueprints, estimates and landscaping designs. Topics include basic principles of design, engineering, drawing and drafting techniques including the use of technology such as computer-aided design. Students will incorporate principles of hardscapes and examine the use of artificial lighting, water systems, and creative features in their designs. Throughout the course, business management practices, employability skills, and safety procedures will also be emphasized.

**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.

*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 5. Structural Engineering**

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: 5.1. Electrical Theory**

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

**Competencies**

5.1.1. Interpret symbols and wiring diagrams.

**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.

5.3.3. Complete a site inventory and analysis, including physical conditions, code and utilities requirements and the environmental impact.

5.3.4. Develop a program list, including intended use, budget, economics, customer wants and needs and maintenance.

5.3.5. Apply the principles of balance, proportion, scale, focal point, emphasis, rhythm, harmony and unity to create a design.

5.3.6. Apply the elements of line, function, form, texture and color to create a design.

5.3.7. Incorporate design, organizational and spatial principles into a design.

5.3.8. Calculate the space requirements and compute various attributes, including length, angle measurement, surface area and volume.

5.3.9. Prepare sketches, drawings, prints, specifications and construction details.

5.3.10. Apply designing and drawing tools and industry-specific software to a project, including computer aided design (CAD) software.

5.3.11. Identify construction documents, common scales, specifications and materials used in construction or fabrication.

5.3.12. Estimate material, construction and equipment needs, availability and costs.

5.3.13. Establish the sequential steps of construction and installation.

**Outcome: 5.4. Surveying and Mapping**

Perform surveying procedures to construct a site plan.

**Competencies**

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: 5.7. Brick, Block and Concrete**

Following a design layout and install a structure using bricks, pavers, blocks, stone or concrete.

**Competencies**

5.7.5. Estimate the construction and materials cost for bricks, pavers, mortar, blocks, stone and concrete.

**Outcome: 5.8. Water Distribution Systems**

Calculate the demand for specific water applications and design and install water supply and drainage components.

**Competencies**

5.8.1. Calculate water demand for specific applications.

5.8.6. Describe factors that are considered when planning and installing a supply and drainage system.

5.8.7. Estimate and compute length, angle of measurement, area, surface area and volume to calculate pipe legs and pipe sizes.

5.8.8. Calculate the slope required for drainage components.

5.8.9. Select supply and drainage components based on their application for a given purpose.

5.8.10. Explain the impact of modifying structural members to accommodate supply and drainage lines.

*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**

6.1.1. Identify soil forming factors and explain how they produce variability in soils.

6.1.2. Describe the relationship among physical properties of soils.

6.1.3. Collect, test and analyze soil samples for physical and chemical properties.

6.1.4. Identify factors (e.g., climate, vegetation, soil texture, drainage, management practices, landscape) affecting organic matter and its function in soil quality.

6.1.5. Determine land use and identify land capabilities classes.

6.1.6. Apply soil conservation practices to reduce soil erosion and compaction.

6.1.7. Compare and contrast the causes and effects of soil erosion.

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: 6.2. 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).

6.2.5. Explain the biotic and abiotic factors affecting water quality.

6.2.6. Monitor and analyze water quality and quantity.

6.2.7. Implement procedures and management practices that maintain or improve water quality.

**Outcome: 6.10. Ecosystems**

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

**Competencies**

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

6.10.5 Connect biotic interactions with the abiotic environment.

6.10.8 Select and implement restoration ecology practices to repair damaged 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**

8.1.8. 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: 8.3. 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.

8.3.9. 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.

8.4.6. Identify the principles of primary and secondary plant growth.

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

8.4.8. Understand the influence of environmental factors on plant growth, development and maintenance.

8.4.9. Manipulate natural and artificial factors to influence plant germination, growth and development.

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

8.4.11. Understand and evaluate the process by which plants are selected.

8.4.13. Evaluate and implement transplanting practices.

8.4.14. Control plant growth through mechanical and chemical means.

8.4.15. Analyze plant water requirements and provide water through artificial or natural means.

*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 | | |