# Agricultural and Environmental Systems Career Field

## Oil and Gas Operations

**Subject Code: 010718**

**Outcome & Competency Descriptions**

**Course Description:**

Students will develop the skills applicable for the exploration, extraction and production of petroleum, natural gas and coal. They will learn practices related to the exploration, leasing, surveying, drilling, geophysical logging and completion process. Students will become familiar with wellhead and surface production equipment. Throughout the course, students will learn sampling, analysis, monitoring and control techniques for effective environmental management in the extractive industries.

**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.

1.1.9. 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.

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

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

1.2.7. Use problem-solving and consensus-building techniques to draw conclusions and determine next steps.

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.

**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.

1.3.4. Identify how federal and state consumer protection laws affect products and services.

1.3.5. Access and implement safety compliance measures (e.g., quality assurance information, safety data sheets [SDSs], product safety data sheets [PSDSs], United States Environmental Protection Agency [EPA], United States Occupational Safety and Health Administration [OSHA]) that contribute to the continuous improvement of the organization.

1.3.6. Identify deceptive practices (e.g., bait and switch, identity theft, unlawful door-to-door sales, deceptive service estimates, fraudulent misrepresentations) and their overall impact on organizational performance.

**Outcome: 1.6. Business Literacy**

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

**Competencies**

1.6.1. Identify business opportunities.

1.6.5. 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.

**Outcome: 1.10. Sales and Marketing**

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

**Competencies**

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.

1.10.9. Describe how product mix (e.g., product line, product items) maximizes sales revenues, market share and profit margin.

**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).

1.11.4. Determine how the quality, quantity and pricing of goods and services are affected by domestic and international competition in a market economy.

1.11.8. Identify the relationships between economy, society and environment that lead to sustainability.

1.11.9. Describe how laws and regulations influence domestic and international trade.

**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.

1.12.12. 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.

1.12.14. Identify the source of electrical hazards and use shutdown and established lock-out/tag-out procedures.

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

1.12.17. Identify symptoms of exposure to health-threatening environments(e.g., temperature; chemical noise, vibration, harshness [NVH] hazards).

**Strand 4. Power Systems**

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

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

Inspect, clean, maintain and perform planned preventative maintenance equipment.

**Competencies**

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.

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

**Outcome: 4.2. Equipment Operations**

Operate and maintain mechanical equipment and power systems.

**Competencies**

4.2.1. Follow original equipment manufacturer (OEM) recommended operating procedures and adjustment specifications as found in the operator's 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 equipment and attachments needed to complete the task per the original equipment manufacturer (OEM) operator's manual.

**Strand 5. Elements of Production**

Learners apply principles of practice related to the management and maintenance of food, agriculture and natural resources systems.

**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: 5.8. 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.

5.8.2. Compare the types, applications and operating principles of pumps and controls.

5.8.5. Describe how waste moves from a fixture through the drain system to the environment.

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

5.8.18. Identify, describe and install cross connection and backflow prevention devices.

**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.

6.1.8. 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 human-made contaminants, and high-risk contaminants.

6.8.5. Describe the environmental impact from both industrial and nonindustrial processes.

**Outcome: 6.9. Hazardous Materials and Waste Management**

Follow and apply handling, storage and recording procedures for hazardous materials and waste.

**Competencies**

6.9.3. Demonstrate appropriate responses for major types of hazardous materials disasters.

6.9.5. Demonstrate safe management, handling, disposal and recycling procedures for hazardous materials and waste.

6.9.8. Identify and describe procedures to transport and store hazardous materials in accordance with regulations.

**Strand 9. Energy**

Learners apply principles of physics, chemistry, earth sciences and mathematics to energy sources, transformations, acquisition, applications and their impacts.

**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 (e.g., oil, natural gas, and coal) and the technology used to generate energy.

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

9.1.5. Identify and describe energy density properties of different types of fuel sources according to industry standards.

9.1.6. Trace the transformations of energy within a system (e.g., mechanical to electrical, chemical to mechanical).

9.1.7. Identify and describe best management practices (e.g., carbon sequestration, conservation, animal safety, efficiency) that lessen environmental impact.

**Outcome: 9.2. Crude Oil and Natural Gas**

Describe the processes for exploring, drilling, producing, transporting, refining and marketing products of crude oil and natural gas.

**Competencies**

9.2.1. Describe the role of geology in the formation, migration and trapping of crude oil and natural gas.

9.2.2. Assess how crude oil and natural gas wells are placed, designed and installed.

9.2.3. Identify and explain the processes associated with drilling (e.g., rig types, blowout prevention, drilling fluids, casing, cementing).

9.2.4. Evaluate different environmental and safety procedures for storage, containment, transporting, recycling, processing and disposing of drilling liquids (e.g., drilling fluids, brine, flow-back).

9.2.5. Identify and apply the appropriate permits and governance associated with crude oil and natural gas production.

9.2.6. Identify the different processes for producing, treating, transporting, processing crude oil and natural gas.

9.2.7. Identify and describe equipment used in the extraction and processing of crude oil and natural gas for up, mid, and down streams process.

9.2.8. Identify the products and byproducts of crude oil and natural gas.