

Construction Technologies Career Field
Heavy Equipment Operations
Subject Code: 178026
Outcome & Competency Descriptions

Course Description:

Students perform heavy equipment operating techniques and perform operator level maintenance. Students will learn to survey using lasers, transits and machine control systems. Additionally, students learn the techniques and processes for clearing, grubbing, stripping, excavating, backfilling, stockpiling, and cutting and spreading of fill material. Throughout the course, safety is emphasized.

Course Description:

Students will learn principles in basic safety (10-hr OSHA), construction math, hand and power tool use and operation, blueprint reading, material handling, communication and employability skills. An emphasis will be placed on safe and green construction practices.

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, résumé 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.

Construction Technologies Career Field
Heavy Equipment Operations
Subject Code: 178026
Outcome & Competency Descriptions

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 affects business operations and organizational performance.
- 1.3.2. Follow protocols and practices necessary to maintain a clean, safe and healthy work environment.
- 1.3.3. Use ethical character traits consistent with workplace standards (e.g., honesty, personal integrity, compassion, justice).
- 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.

Construction Technologies Career Field
Heavy Equipment Operations
Subject Code: 178026
Outcome & Competency Descriptions

- 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.
- 1.3.7. Identify the labor laws that affect employment and the consequences of noncompliance for both employee and employer (e.g., harassment, labor, employment, employment interview, testing, minor labor laws, Americans with Disabilities Act, Fair Labor Standards Acts, Equal Employment Opportunity Commission [EEOC]).
- 1.3.8. Verify compliance with computer and intellectual property laws and regulations.
- 1.3.9. Identify potential conflicts of interest (e.g., personal gain, project bidding) between personal, organizational and professional ethical standards.

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 1.5. Global Environment

Evaluate how beliefs, values, attitudes and behaviors influence organizational strategies and goals.

Competencies

- 1.5.1. Describe how cultural understanding, cultural intelligence skills and continual awareness are interdependent.
- 1.5.2. Describe how cultural intelligence skills influence the overall success and survival of an organization.
- 1.5.3. Use cultural intelligence to interact with individuals from diverse cultural settings.
- 1.5.4. Recognize barriers in cross-cultural relationships and implement behavioral adjustments.
- 1.5.5. Recognize the ways in which bias and discrimination may influence productivity and profitability.

Construction Technologies Career Field
Heavy Equipment Operations
Subject Code: 178026
Outcome & Competency Descriptions

- 1.5.6. Analyze work tasks for understanding and interpretation from a different cultural perspective.
- 1.5.7. Use intercultural communication skills to exchange ideas and create meaning.
- 1.5.8. Identify how multicultural teaming and globalization can foster development of new and improved products and services and recognition of new opportunities.

Outcome 1.8. Operations Management

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

Competencies

- 1.8.1. Forecast future resources and budgetary needs using financial documents (e.g., balance sheet, demand forecasting, financial ratios).
- 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.
- 1.8.4. Identify alternative actions to take when goals are not met (e.g., changing goals, changing strategies, efficiencies).
- 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.
- 1.8.7. Collect information and feedback to help assess the organization's strategic planning and policymaking processes.
- 1.8.8. Identify routine activities for maintaining business facilities and equipment.
- 1.8.9. Develop a budget that reflects the strategies and goals of the organization.
- 1.8.10. Analyze how business management and environmental management systems (e.g., health, safety) contribute to continuous improvement and sustainability.

Outcome 1.12. Cyber Hygiene

Apply digital information security principles to keep information secure.

Competencies

- 1.12.1. Identify the purpose and practices of Cyber Hygiene.
- 1.12.2. Differentiate between appropriate and inappropriate information.
- 1.12.3. Interpret security policies through job specific training and training updates.
- 1.12.4. Apply secure password behavior.
- 1.12.5. Apply physical and virtual situational awareness (e.g., clean desk policies, shoulder surfing, social engineering, tailgating).

Construction Technologies Career Field
Heavy Equipment Operations
Subject Code: 178026
Outcome & Competency Descriptions

Strand 2. Safety, Tools, and Equipment

Learners apply principles of protection, prevention and mitigation to create and maintain safe working conditions at construction sites. Knowledge and skills may be applied in all aspects of personal site safety to meet all applicable standards.

Outcome 2.1. Site Safety

Handle materials, prevent accidents and mitigate hazards.

Competencies

- 2.1.1. 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.
- 2.1.2. Identify and rectify or mitigate construction hazards (e.g., thresholds, slippery surfaces, lighting and workplace clutter).
- 2.1.3. Identify and apply load factors for constructing scaffolding, railings, ladders and temporary structures.
- 2.1.4. Apply inspection, rejection criteria, hitch configurations and load-handling practices to slings and rigging hardware.
- 2.1.5. Demonstrate the proper use of American National Standards Institute (ANSI) hand signals.
- 2.1.6. Identify the source of electrical hazards and use shutdown and established lock-out/tag-out procedures.
- 2.1.7. Identify procedures for the handling, storage and disposal of hazardous materials.
- 2.1.8. Identify the location of emergency flush showers, eyewash fountains, Safety Data Sheets (SDSs), fire alarms and exits.
- 2.1.9. Select and operate fire extinguishers based on the class of fire.
- 2.1.10. Create a hazardous materials safety plan (e.g., liquid and airborne materials).
- 2.1.11. Describe the interactions of incompatible substances when measuring and mixing chemicals.

Outcome 2.2. Personal Safety

Practice personal safety in construction.

Competencies

- 2.2.1. Interpret personal safety rights according to the employee Right-to-Know plan.
- 2.2.2. Describe how working under the influence (e.g., drugs, alcohol and stimulants/caffeine) increases the risk of accident, lowers productivity, raises insurance costs, and reduces profits.
- 2.2.3. Select, use, store, maintain and dispose of personal protective equipment (PPE) appropriate to job tasks, conditions and materials.
- 2.2.4. Identify workplace risk factors associated with lifting, operating and moving heavy objects and establish an ergonomics process.
- 2.2.5. Identify, inspect and use safety equipment appropriate for the task.
- 2.2.6. Demonstrate first aid and cardiopulmonary resuscitation (CPR).
- 2.2.7. Identify and describe hazards associated with using electronic devices on the job site.
- 2.2.8. Identify and describe hazards associated with improper clothing and poor hygiene.

Construction Technologies Career Field
Heavy Equipment Operations
Subject Code: 178026
Outcome & Competency Descriptions

- 2.2.9 Describe trenching and excavation hazards (e.g., soil types, cave in, utilities, underground obstacles).
- 2.2.10 Describe the process for identifying and locating existing site utilities.

Outcome 2.3. Equipment Operation

Operate equipment used to move materials, earth and other heavy materials.

Competencies

- 2.3.1. Select the equipment and attachments needed to complete the task.
- 2.3.2. Follow the manufactures' recommendations for safety, maintenance, limitations and use.
- 2.3.3. Perform pre- and post-operation inspections and adjustments and report malfunctions.
- 2.3.4. Operate levers, pedals or valves to activate power equipment.
- 2.3.5. Drive and maneuver equipment with and without trailers.

Outcome 2.4. Equipment and Machinery Preventative Maintenance

Clean, maintain and perform planned preventative maintenance (PPM) on equipment and machinery.

Competencies

- 2.4.1. Lubricate machinery and equipment.
- 2.4.2. Ensure the presence and functionality of safety systems and hardware.
- 2.4.3. Service electrical systems (e.g., fuses, bulbs).
- 2.4.4. Perform machine adjustments (e.g., belts, drive chains).
- 2.4.5. Service filtration systems.
- 2.4.6. Identify, select and maintain fluid levels.
- 2.4.7. Maintain instrument, machinery and equipment cleanliness, appearance and safety devices.
- 2.4.8. Inspect and maintain fluid conveyance and storage components (e.g., hoses, lines, valves, nozzles).
- 2.4.9. Inspect and maintain tooling and implements.
- 2.4.10. Document and log equipment maintenance records.

Strand 3. Structural Construction

Learners apply principles of architectural engineering to erect residential, commercial and industrial buildings. Knowledge and skills may be applied in constructing footings and foundations; framing floors, walls, ceilings, roofs and stairs; completing exterior and interior finishes; and repairing, restoring or remodeling existing structures.

Outcome 3.3. Excavation

Perform excavation activities from clearing and grubbing to finish grading in accordance with excavation specifications on prints and in local building codes.

Construction Technologies Career Field
Heavy Equipment Operations
Subject Code: 178026
Outcome & Competency Descriptions

Competencies

- 3.3.1. Describe excavation, trenching, and shoring designs.
- 3.3.2. Compare the effects of soil properties, profiles and types on construction and describe fill placement processes (e.g., lifts, geomat fabrics, compaction, density, moisture content).
- 3.3.3. Collect samples and explain the environmental impact of contaminated soil and water on the worksite.
- 3.3.4. Explain disposal procedures for contaminated soil, water and waste.
- 3.3.5. Describe procedures to control water runoff and drainage.
- 3.3.6. Identify the actual location and elevation and determine variance.
- 3.3.7. Check alignment and elevations.
- 3.3.8. Clear and grub land to prepare site for grading.
- 3.3.9. Explain the types of grade (e.g., subgrade, finished grade).
- 3.3.10. Identify the types of stakes and describe their functions.
- 3.3.11. Describe fill materials, their appropriateness and their functions.
- 3.3.12. Lay out stakes in sequence and set grade.

Strand 6. Construction Management and Jobsite Maintenance

Learners apply principles of business, facility and site operations and project management to build and operate residential, commercial and industrial facilities. Knowledge and skill may be applied in managing and supervising site operations; developing work sequences for tasks and units of work; coordinating material and equipment delivery; planning building stages and the build environment; and providing facility management, and maintenance services.

Outcome 6.6. Building Maintenance

Provide maintenance, repair and renovations to maintain the long-term conservation and protection of facility buildings and grounds.

Competencies

- 6.6.12. Schedule preventative maintenance, repair, and renovation to maintain a safe and healthy environment using computer-aided facilities management programs as appropriate.
- 6.6.16. Compare and contrast green and traditional practices in the selection of materials, chemicals and equipment.