VALIDATION COPY

Construction Equipment Operation
Mississippi Curriculum Framework

(Program CIP: 49.0202 Construction/Heavy Equipment/Earthmoving Equipment Operation)

July 2016

Published by:
Mississippi Community College Board
Division of Workforce, Career, and Technical Education
3825 Ridgewood Road
Jackson, MS 39211
Phone: 601-432-6155
Email: curriculum@mccb.edu

Faculty Writing Team Members

Joey Chassion, Copiah-Lincoln Community College
Brad Ladner, Pearl River Community College

Administrator Contributing Team Members

Brent Duguid, Copiah-Lincoln Community College
Dr. Ed Pinero, Pearl River Community College

Business and Industry Contributing Members

Billy Case, City of Brookhaven*
Mark Godfrey, The Blain Companies
Keith Lewis, City of Brookhaven

***Denotes an industry member who attended the writing team meeting.**

Office of Curriculum and Instruction Team Members

Krystal Berry, Curriculum Specialist, Mississippi Community College Board
Angela Bryan, Director of Curriculum and Instruction, Mississippi Community College Board

The Office of Curriculum and Instruction (OCI) was founded in 2013 under the Division of Workforce, Career, and Technical Education at the Mississippi Community College Board (MCCB). The office is funded through a partnership with The Mississippi Department of Education (MDE), who serves as Mississippi's fiscal agent for state and federal Career and Technical Education (CTE) Funds. The OCI is tasked with developing statewide CTE curriculum, programming, and professional development designed to meet the local and statewide economic demand.

Contents

ADOPTION OF NATIONAL CERTIFICATION STANDARDS

The **National Center for Construction Education and Research (NCCER)** is a not-for-profit 501(c)(3) Education foundation created in 1996. It was developed with the support of more than 125 construction CEOs and various association and academic leaders who united to revolutionize training for the construction industry. Sharing the common goal of developing a safe and productive workforce, these companies created a standardized training and credentialing program for the industry. This progressive program has evolved into curricula for more than 70 craft areas and a complete series of more than 70 assessments offered in over 4,000 NCCER-accredited training and assessment locations across the United States.

NCCER develops standardized construction and maintenance curricula and assessments with portable credentials. These credentials are tracked through NCCER's National Registry which allows organizations and companies to track the qualifications of their craft professionals and/or check the qualifications of possible new hires. The National Registry also assists craft professionals by maintaining their records in a secure database.

NCCER's process of accreditation, instructor certification, standardized curriculum, national registry, assessment, and certification is a key component in the industry's workforce development efforts. NCCER also drives multiple initiatives to enhance career development and recruitment efforts for the industry. NCCER is headquartered in Alachua, Fl., and is affiliated with the University of Florida's M.E. Rinker, Sr. School of Building Construction.

As the accrediting body for the industry, NCCER establishes the benchmark for quality training and assessments. By partnering with industry and academia, NCCER has developed a system for program accreditation that is similar to those found in institutions of higher learning. This process fosters national unity among the construction industry while providing a defined career path with industry-recognized credentials.

NCCER's accreditation process assures that students and craft professionals receive quality training based on uniform standards and criteria. These standards are outlined in the NCCER Accreditation Guidelines and must be adhered to by all NCCER Accredited Training Sponsors and Accredited Assessment Centers.

For more information related to implementing NCCER at your local campus, please visit:

http://www.nccer.org/heavy-equipment-operations.

INDUSTRY JOB PROJECTION DATA

Construction/Heavy Equipment/Earthmoving Equipment Operation occupations require medium to long-term on-the-job training. The Bureau of Labor Statistics reports that there will be a 9.57% increase in job outlook at the regional level and a 14.84% increase at the state level. Median annual income for this occupation is $31,109.87. A summary of occupational data from the Bureau of Labor Statistics Data Center and the State Workforce Investment Board data is displayed below (www. http://swib.ms.gov/DataCenter/):

Table 1: Education Level

Program Occupations	Education Level
Logging Equipment Operator	Moderate-Term-on-the-Job Training
Paving, Surfacing, and Tamping Equipment Operators	Moderate-Term-on-the-Job Training
Pile-Driver Operators	Moderate-Term-on-the-Job Training
Operating Engineers and Other Construction Equipment Workers	Moderate-Term-on-the-Job Training
Highway Maintenance Workers	Moderate-Term-on-the-Job Training
Rail-Track Laying and Maintenance Equipment Operators	Moderate-Term-on-the-Job Training
Earth Drillers, Except Oil and Gas	Moderate-Term-on-the-Job Training
Continuous Mining Machine Operators	Moderate-Term-on-the-Job Training
Mine Cutting and Challenging Machine Operators	Moderate-Term-on-the-Job Training
Mining Machine Operators, All Other	Moderate-Term-on-the-Job Training
Extraction Workers, All Other	Moderate-Term-on-the-Job Training
Crane and Tower Operators	Long-Term-on-the-Job Training
Dredge Operators	Moderate-Term-on-the-Job Training
Excavating and Loading Machine and Dragline Operators	Moderate-Term-on-the-Job Training
Hoist and Winch Operators	Moderate-Term-on-the-Job Training

Table 2: Occupational Overview

	Region	State	United States
2010 Occupational Jobs	6506	8030	680100
2020 Occupational Jobs	7342	8926	739612
Total Change	836	896	59512
Total % Change	12.85%	11.16%	8.75%
2010 Median Hourly Earnings	$14.96	$14.81	$19.07
2010 Median Annual Earnings	$31,109.87	$30,813.06	$39,669.23
Annual Openings	83	89	5951

Table 3: Occupational Breakdown

Description	2010 Jobs	2020 Jobs	Annual Openings	2010 Hourly Earnings	2010 Annual Earnings 2,080 Work Hours
Logging Equipment Operator	127	114	-1	$15.25	$31,720.00
Paving, Surfacing, and Tamping Equipment Operators	605	658	5	$13.25	$27,560.00
Pile-Driver Operators	101	107	0	$16.06	$33,404.80
Operating Engineers and Other Construction Equipment Workers	2655	3124	46	$15.03	$31,262.40
Highway Maintenance Workers	1518	1731	21	$11.11	$23,108.80
Rail-Track Laying and Maintenance Equipment Operators	155	171	1	$20.00	$41,600.00
Earth Drillers, Except Oil and Gas	271	300	2	$12.27	$25,521.60
Continuous Mining Machine Operators	17	18	0	$15.28	$31,782.40
Mine Cutting and Challenging Machine Operators	<10	<10	0	$15.28	$31,782.40
Mining Machine Operators, All Other	<10	<10	0	$15.28	$31,782.40
Extraction Workers, All Other	22	22	0	$15.28	$31,782.40
Crane and Tower Operators	507	508	0	$17.51	$36,420.80
Dredge Operators	<10	<10	0	$14.60	$30,368.00
Excavating and Loading Machine and Dragline Operators	509	570	6	$13.85	$28,808.00
Hoist and Winch Operators	<10	<10	0	$14.30	$29,744.00
TOTAL	**6506**	**7342**	**83**	**$14.96**	**$31,109.87**

Table 4: Occupational Change

Description	Regional Change	Regional % Change	State % Change	National % Change
Occupational Health and Safety Specialists	22	9.57%	14.84%	11.07%

ARTICULATION

There are currently no secondary programs that will articulate to the Occupational Safety and Health Technology program of study. Dual credit and local partnerships are encouraged.

TECHNICAL SKILLS ASSESSMENT

Colleges should report the following for students who complete the program with a career certificate, technical certificate, or an Associate of Applied Science Degrees for technical skills attainment. To use the approved Alternate Assessment for the following programs of study, colleges should provide a Letter of Notification to the Director of Career Technical Education at the MS Community College Board. Please see the following link for further instructions: http://www.mccb.edu/wkfEdu/CTDefault.aspx.

CIP Code	Program of Study	
15.0701	Construction Equipment Operation	
Level	**Standard Assessment**	**Alternate Assessment**
Career	MS-CPAS-2 Postsecondary Construction Equipment Operation: Year 1	NCCER – Core Level NCCER Heavy Equipment Operations – Level 1

ONLINE AND BLENDED LEARNING OPPORTUNITIES

Course content includes lecture and laboratory semester credit hours. Faculty members are encouraged to present lecture related content to students in an online or blended learning environment. Training related to online and blended learning will be available to faculty members through the MS Community College Board.

INSTRUCTIONAL STRATEGIES

Instructional strategies for faculty members implementing the curriculum can be found through the Office of Curriculum and Instruction's professional development.

ASSESSMENT STRATEGIES

The Office of Curriculum and Instruction's professional development offer assessment strategies to faculty members implementing the curriculum. Additionally, standards were included in course content when appropriate.

Research Abstract

As the world economy continues to evolve, businesses and industries must adopt new practices and processes in order to survive. Quality and cost control, work teams and participatory management, and an infusion of technology are transforming the way people work and do business. Employees are now expected to read, write, and communicate effectively; think creatively, solve problems, and make decisions; and interact with each other and the technologies in the workplace. Vocational-technical programs must also adopt these practices in order to provide graduates who can enter and advance in the changing work world. In 2010, there were 6506 Construction/Heavy Equipment/Earthmoving Equipment Operation occupations in the United States. That number is expected to increase to 7342 by 2020. The earnings potential for construction equipment operators is $23,108.80 to $41,600.00.

The curriculum framework in this document reflects these changes in the workplace and a number of other factors that impact on local vocational-technical programs. Federal and state legislation calls for articulation between high school and community college programs, integration of academic and vocational skills, and the development of sequential courses of study that provide students with the optimum educational path for achieving successful employment. National skills standards, developed by industry groups and sponsored by the U.S. Department of Education and Labor, provide vocational educators with the expectations of employers across the United States. All of these factors are reflected in the framework found in this document.

This curriculum was last validated and approved in 2009. In the spring of 2016, the Office of Curriculum and Instruction (OCI) met with representatives from the Construction Equipment field. Program faculty, administrators, and industry members were consulted regarding industry workforce needs and trends. An industry questionnaire was used to gather feedback concerning the trends and needs, both current and future, of their field.

Changes for the curriculum included: removal of references to scrapers from course descriptions and student learning objectives; inclusion of more critical thinking skills; inclusion of student learning outcomes focusing on road boring – including boring and locating activities; curriculum mapping to NCCER Core and NCCER Heavy Equipment Operation Level 1 standards. Additionally, NCCER Heavy Equipment Operation Level 2 and some Level 3 standards have been mapped into the curriculum so they may be adopted at a local level.

Revision History

2009 - Research & Curriculum Unit, Mississippi State University
2016 - Office of Curriculum & Instruction, Mississippi Community College Board

PROGRAM DESCRIPTION

This postsecondary instructional program prepares individuals to safely operate and perform preventive maintenance on a variety of construction equipment. The program also includes instruction in digging, ditching, sloping, stripping, grading, back filling, clearing, excavating, and handling of materials. An individual successfully completing this program will have entry-level skills for employment as a construction equipment operator.

Certification by the National Center for Construction Education (NCCER):

This curriculum has been aligned to the National Center for Construction Education and Research (NCCER) Heavy Equipment Operations standards and objectives. Students who study this curriculum under the supervision of an instructor who has been certified by the NCCER are eligible to be tested on each module. Students who successfully pass these tests may be certified by the NCCER by the instructor and will receive documentation from NCCER. The 30-hour Career certificate program covers subjects in Core and Level 1. Students who complete the Career certificate may also complete certain modules from NCCER Level 2 and Level 3 credentials depending upon the local college implementation.

This curriculum offers an accelerated transition pathway at 15 hours and a career Certificate at 30 hours in Construction Equipment Operations. Students completing this program are prepared for entry-level positions at any construction facility. They will have acquired the basic technical skills in using heavy equipment and have a broadened vocabulary to make the job-specific learning less difficult. They will also possess team-building skills, safety awareness, environmental awareness, communication skills, and computer skills that are critical in the workplace.

SUGGESTED COURSE SEQUENCE- CONSTRUCTION EQUIPMENT OPERATIONS

Accelerated Pathway Credential

			SCH Breakdown			Contact Hour Breakdown		Certification Information
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Total Contact Hours	Lecture	Lab	Certification Name
CEV 1212	Safety I	2	1	2	45	15	30	
CEV 1313	Service and Preventative Maintenance I	3	2	2	60	30	30	
CEV 1416	Equipment Operation I	6	1	10	165	15	150	
	Instructor Approved Electives	4						
	TOTAL	**15**						

Career Certificate Required Courses

			SCH Breakdown			Contact Hour Breakdown		Certification Information
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Total Contact Hours	Lecture	Lab	Certification Name(s)
CEV 1212	Safety I	2	1	2	45	15	30	NCCER Core & NCCER Heavy Equipment Operations Core and Level 1
CEV 1313	Service and Preventative Maintenance I	3	2	2	60	30	30	
CEV 1416	Equipment Operation I	6	1	10	165	15	150	
CEV 1514	Grade Work I	4	1	6	105	15	90	
CEV 1222	Safety II	2	1	2	45	15	30	
CEV 1323	Service and Preventative Maintenance II	3	1	4	75	15	60	
CEV 1426	Equipment Operation II	6	1	10	165	15	150	
CEV 1524	Grade Work II	4	1	6	105	15	90	
	TOTAL	**30**						

COURSES

Course Number and Name: **CEV 1212 Safety I**

Description: Personal safety, fire safety, and rules for safety of each machine to include pre-start, operational, post-operation, and traffic. (2 sch: 1-hr lecture, 2-hr lab)

Hour Breakdown:

Semester Hours	Lecture	Lab	Contact Hours
2	1	2	45

Prerequisite: None

Student Learning Objectives:

1. Identify and discuss personal safety in the operation of heavy equipment.
   a. Explain the use of controls, clearance of work area, applications of pre-start checks, and utilization of planned work activities.
   b. Discuss fire safety procedures and equipment for use in various types of fires.
   c. Discuss clothing that is worn for protection and safety.
   d. Describe basic first aid and how to arrange for treatment and/or transportation for the injured.
   e. Identify hazardous materials found on the job site using a material safety data sheet (MSDS).
   f. Identify proper methods for moving heavy items.
   g. Describe factors in storing hazardous materials.
   h. Describe safety precautions and practices related to fuel and oil system maintenance.
2. Identify and apply safety rules to traffic patterns.
   a. Identify traffic patterns and the impact on safety.
   b. Apply basic safety rules to various traffic patterns.
   c. Discuss the importance of safety rules for traffic patterns.

NCCER Standards

Core

Module One (00101-15) - Basic Safety

1. Describe the importance of safety, the causes of workplace incidents, and the process of hazard recognition and control.
   a. Define incidents and the significant costs associated with them.
   b. Identify the common causes of incidents and their related consequences.
   c. Describe the processes related to hazard recognition and control, including the Hazard Communication (HAZCOM) Standard and the provisions of a Safety Data Sheet (SDS).
2. Describe the safe work requirements for elevated work, including fall protection guidelines.
   a. Identify and describe various fall hazards.
   b. Identify and describe equipment and methods used in fall prevention and fall arrest.
   c. Identify and describe the safe use of ladders and stairs. d. Identify and describe the safe use of scaffolds.
3. Identify and explain how to avoid struck-by and caught-in-between hazards.
   a. Identify and explain how to avoid struck-by and caught-in-between hazards.
   b. Identify and explain how to avoid caught-in and caught-between hazards.
4. Identify common energy-related hazards and explain how to avoid them.
   a. Describe basic job-site electrical safety guidelines.
   b. Explain the importance of lockout/tagout and describe basic procedures.

5. Identify and describe the proper use of personal protective equipment (PPE).

a. Identify and describe the basic use of PPE used to protect workers from bodily injury.
b. Identify potential respiratory hazards and the basic respirators used to protect workers against those hazards.

6. Identify and describe other specific job-site safety hazards.
    a. Identify various exposure hazards commonly found on job sites.
    b. Identify hazards associated with environmental extremes.
    c. Identify hazards associated with hot work.
    d. Identify fire hazards and describe basic firefighting procedures.
    e. Identify confined spaces and describe the related safety considerations.

Module Three (00103-15) - Introduction to Hand Tools

1. Identify and explain how to use various types of hand tools.
    a. Identify and explain how to use various types of hammers and demolition tools.
    b. Identify and explain how to use various types of chisels and punches.
    c. Identify and explain how to use various types of screwdrivers.
    d. Identify and explain how to use various types of non-adjustable and adjustable wrenches.
    e. Identify and explain how to use various types of socket and torque wrenches.
    f. Identify and explain how to use various types of pliers and wire cutters.
2. Identify and describe how to use various types of measurement and layout tools.
    a. Identify and explain how to use rules and other measuring tools.
    b. Identify and explain how to use various types of levels and layout tools.
3. Identify and explain how to use various types of cutting and shaping tools.
    a. Identify and explain how to use handsaws.
    b. Identify and explain how to use various types of files and utility knives.
4. Identify and explain how to use other common hand tools.
    a. Identify and explain how to use shovels and picks.
    b. Identify and explain how to use chain falls and come-alongs.
    c. Identify and explain how to use various types of clamps.

Module Four (00104-15) - Introduction to Power Tools

1. Identify and explain how to use various types of power drills and impact wrenches.
    a. Identify and explain how to use common power drills and bits.
    b. Identify and explain how to use a hammer drill.
    c. Identify and explain how to use pneumatic drills and impact wrenches.
2. Identify and explain how to use various types of power saws.
    a. Identify and explain how to use a circular saw.
    b. Identify and explain how to use saber and reciprocating saws.
    c. Identify and explain how to use a portable band saw.
    d. Identify and explain how to use miter and cutoff saws.
3. Identify and explain how to use various grinders and grinder attachments.
    a. Identify and explain how to use various types of grinders.
    b. Identify and explain how to use various grinder accessories and attachments.
4. Identify and explain how to use miscellaneous power tools.
    a. Identify and explain how to use pneumatic and powder-actuated fastening tools.
    b. Identify and explain how to use pavement breakers.
    c. Identify and explain the uses of hydraulic jacks.

Module Five (00105-15) – Introduction to Construction Drawings

1. Identify and describe various types of construction drawings, including their fundamental components and features.
    a. Identify various types of construction drawings.
    b. Identify and describe the purpose of the five basic construction drawing components.
    c. Identify and explain the significance of various drawing elements, such as lines of construction, symbols, and grid lines.
    d. Identify and explain the use of dimensions and various drawing scales.
    e. Identify and describe how to use engineer's and architect's scales.

NCCER Standards
Heavy Equipment Operations – Level I
Module 2 (22102-12) – Heavy Equipment Safety

1. Explain the importance of safety when working with heavy equipment.
2. State the purposes of signs, tags, barricades, and lockout/tagout devices used on construction sites.
3. Describe the long- and short-term health effects, first-aid measures, handling and storage, and/or required personal protective equipment (PPE) for a chemical using a material data safety sheet (MSDS).
4. Identify safeguards used in a highway construction work zone.
5. State general guidelines for safe operation, maintenance, and transportation of heavy equipment.
6. Explain the dangers of working around an excavation area with heavy equipment.

Course Number and Name: **CEV 1222 Safety II**

Description: Pedestrian safety, safety communications, and safety procedures in working near utilities.

Hour Breakdown:

Semester Hours	Lecture	Lab	Contact Hours
2	1	2	45

Prerequisite: Instructor Approved

Student Learning Objectives:

1. Demonstrate the ability to identify/describe personal safety.
    a. Describe safety precautions and practices related to terrains.
    b. Describe the general safety rules for pedestrian safety.
    c. Identify and describe the safety procedures in working near overhead and underground utilities.
    d. Describe the safety procedures to follow to prevent a cave-in or collapse of trenches.
2. Demonstrate the ability to perform required safety communications.
    a. Demonstrate safety communications including flags, markers, and hand signals.
    b. Demonstrate, with each machine, the use of standard hand signals.

NCCER
Core
Module Seven (00107-15) – Basic Communication Skills

1. Describe the communication, listening, and speaking processes and their relationship to job performance.
    a. Describe the communication process and the importance of listening and speaking skills.
    b. Describe the listening process and identify good listening skills.
    c. Describe the speaking process and identify good speaking skills.
2. Describe good reading and writing skills and their relationship to job performance.
    a. Describe the importance of good reading and writing skills.
    b. Describe job-related reading requirements and identify good reading skills.
    c. Describe job-related writing requirements and identify good writing skills.

NCCER Standards
Heavy Equipment Operations – Level II
Module Five (22210-13) – Site Work

1. Describe the safety practices associated with site grading work.
    a. Explain the purpose of a site safety program.
    b. Describe why safety inspections and investigations are important.
    c. Explain how hazardous materials are controlled on a job site.
    d. Describe safety practices associated with trenching and excavations.
    e. Describe how to prepare heavy equipment for transporting.
2. Describe the methods used to control water on job sites.
    a. Explain the importance of maintaining proper drainage on a job site.
    b. Describe the methods used to control groundwater and surface water.

   c. Describe the safety practices and construction methods used when working around bodies of water.
3. Explain how grades are established on a job site.
   a. Describe how to set grades from a benchmark.
   b. Describe how grades are set for highway construction.
   c. Describe how grades are set for building construction.
   d. Explain how grading operations are performed.
   e. Describe the use of stakeless and stringless grading systems.
4. Describe grading and installation practices for pipe-laying operations.
   a. Explain how grades are established for pipelaying operations.
   b. Describe the equipment and methods used to lay pipe.

Course Number and Name: **CEV 1313 Service and Preventative Maintenance I**

Description: Characteristics of oils and greases, fuel handling procedures, and performing minor mechanical maintenance. Practice includes servicing a fuel filter system and changing engine oil.

Hour Breakdown:

Semester Hours	Lecture	Lab	Contact Hours
3	2	2	60

Prerequisite: Instructor Approved

Student Learning Objectives:

1. Describe and apply principles of fuel operations.
    a. Transfer fuel from storage to equipment, emphasizing correct techniques of safety and cleanliness.
    b. Service the fuel filtering system on an engine, emphasizing cleanliness, efficiency, and checking for leaks.
2. Identify and perform services to the engine oil and grease systems.
    a. Identify types of oils and greases by their distinctive characteristics.
    b. Distinguish between clean and contaminated oil.
    c. Recognize indications of contaminants that could cause a malfunction in the engine.
    d. Change engine oil as directed by the manufacturer's specifications giving emphasis to cleanliness, proper handling techniques, use of containers, and checking for leaks.
3. Identify minor mechanical problems, and repair as needed.
    a. Identify and repair minor fluid leaks.
    b. Identify and repair minor electrical problems.
    c. Adjust tracks and brakes as needed.

NCCER Standards
Heavy Equipment Operations – Level I
Module Five (22105-12) – Utility Tractors

1. Identify the operating controls of a typical utility tractor.
2. Describe the different types of transmissions used on utility tractors.
3. Explain the safety measures necessary to operate utility tractors and hydraulic systems.
4. Describe the proper methods for operating a utility tractor on slopes and hills.
5. Explain the proper method for adjusting a drawbar.
6. Perform prestart inspection and maintenance procedures.
7. Start, warm up, and shut down a gasoline-powered and diesel-powered tractor engine.
8. Perform basic maneuvering with a tractor.
9. Attach implements to a drawbar, three-point hitch, or power takeoff.
10. Connect hydraulic-powered attachments to the tractor.

Course Number and Name: **CEV 1323 Service and Preventative Maintenance II**

Description: Lubrication procedures; servicing air filters; servicing cooling systems; servicing hydraulic systems; and installation, removal, and storage of batteries..

Hour Breakdown:

Semester Hours	Lecture	Lab	Contact Hours
3	1	4	75
3	2	2	60

Prerequisite: Instructor Approved

Student Learning Objectives:

1. Demonstrate the ability to perform lubrication procedures on the equipment.
    a. Describe safety precautions and practices related to operating the lubrication equipment.
    b. Follow manufacturer's specifications in lubricating the equipment.
    c. Perform basic lubricating operations.
2. Demonstrate the ability to safely service the air filter system on the equipment.
    a. Identify the type of air filters used on various equipment.
    b. Inspect and clean/replace the air filter on various equipment.
    c. Describe the functions of the pre-cleaner.
    d. Inspect and clean/replace the pre-cleaner as required.
3. Demonstrate the ability to identify/discuss and maintain the cooling system.
    a. Describe the safety procedures needed for maintenance on the equipment.
    b. Identify and describe the components of an engine cooling system.
    c. Provide the necessary services to the cooling system.
    d. Winterize a water-cooled engine.
4. Develop the ability to provide basic services to the batteries on various equipment.
    a. Identify the safety procedures to follow when providing services to batteries.
    b. Identify batteries according to voltage and ampere-hour capacity.
    c. Remove and install batteries on various equipment.
    d. Discuss and demonstrate the procedures for the storage of batteries.
5. Develop the ability to safely service a hydraulic system on various equipment.
    a. Identify safety procedures when working on a hydraulic system.
    b. Identify the major components of a hydraulic system on various equipment.
    c. Discuss the flow of oil through the system and possible malfunctions of each part.
    d. Provide basic services to a hydraulic system including draining the oil, replacing the filter, and filling with new oil.
    e. Inspect, remove, and replace various hydraulic hoses.

NCCER
Heavy Equipment Operations – Level II
Module Two (22202-13) – On-Road Dump Trucks

1. Identify the types of on-road dump trucks.
    a. Identify and describe standard dump trucks.
    b. Identify and describe special dump trucks and trailers.
2. Identify and describe the instruments and specialized control systems found on an on-road dump truck.
    a. Identify and describe instruments.
    b. Identify and describe control systems.

3. Describe the operator inspection and maintenance requirements for an on-road dump truck.
    a. Describe inspection, startup, and shutdown procedures.
    b. Identify preventive maintenance procedures that must be performed.
4. Describe safe on-road driving practices for on-road dump trucks.
    a. State the normal driving practices associated with dump truck operation.
    b. Describe how to handle a dump truck in an emergency.
5. Describe the procedures for operating a dump truck on the job.
    a. State the safety practices associated with dump truck operation on a job site.
    b. Describe proper loading, dumping, and snowplowing procedures

Course Number and Name: **CEV 1416 Equipment Operation I**

Description: This course focuses on the application of proven management principles and techniques to the management of safety and health and loss control programs.

Hour Breakdown:

Semester Hours	Lecture	Lab	Contact Hours
6	1	10	165

Prerequisite: Instructor Approved

Student Learning Objectives:

1. Identify employment opportunities.
    a. Identify employment opportunities with the county, state, and federal governments.
    b. Identify employment opportunities with private contractors in maintenance and construction.
2. Demonstrate the ability to safely operate the backhoe.
    a. Describe safety precautions and practices related to the operation of the backhoe.
    b. Demonstrate the safe operation of each control on the backhoe.
    c. Align the backhoe with a set of stakes, keeping on the centerline while operating.
    d. Dig a trench (or similar excavation) to specifications.
3. Demonstrate the ability to safely operate the grader.
    a. Describe safety precautions and practices related to the operation of the grader.
    b. Demonstrate the safe operation of each control on the grader.
    c. Demonstrate the procedures for typical road construction and maintenance.
4. Demonstrate the ability to load various equipment (backhoe and grader) for transportation.
    a. Explain safety precautions when loading and unloading equipment.
    b. Demonstrate how to load various equipment for transportation.
    c. Demonstrate how to unload various equipment from transportation.

NCCER
Heavy Equipment Operations – Level I
Module One (22101-12) – Orientation to the Trade

1. Explain the basic terminology, types, and uses of equipment.
2. Identify career opportunities available to heavy equipment operators and explain the purpose and objectives of an apprentice training program.
3. Explain the responsibilities and characteristics of a good operator.
4. Explain the importance of heavy equipment safety

Module Three (22103-12) – Identification of Heavy Equipment

1. Identify the various types of heavy equipment and explain their primary uses.
2. Identify and explain the systems that make up the drive system used on heavy equipment.
3. Explain the basics of a hydraulic system and identify hydraulic components.

Module Four (22104-12) – Basic Operational Techniques

1. Describe basic prestart activities for heavy equipment machinery.
2. Describe basic safety measures associated with operating heavy equipment.

3. Explain how to properly start, operate, and shut down the following types of heavy equipment: utility tractors, dozers, loaders, backhoes, excavators, compaction equipment, motor graders, scrapers, on road dump trucks, off-road dump trucks, forklifts, skid steers, and trenchers.

Module Eight (00108-15) – Basic Employability Skills

1. Describe the opportunities in the construction business and how to enter the construction workforce.
    a. Describe the construction business and the opportunities offered by the trades.
    b. Explain how workers can enter the construction workforce
2. Explain the importance of critical thinking and how to solve problems.
    a. Describe critical thinking and barriers to solving problems.
    b. Describe how to solve problems using critical thinking.
    c. Describe problems related to planning and scheduling.
3. Explain the importance of social skills and identify ways good social skills are applied in the construction trade.
    a. Identify good personal and social skills.
    b. Explain how to resolve conflicts with co-workers and supervisors.
    c. Explain how to give and receive constructive criticism.
    d. Identify and describe various social issues of concern in the workplace.
    e. Describe how to work in a team environment and how to be an effective leader.

NCCER
Heavy Equipment Operations – Level III
Module Five (22302-14) – Dozers

1. Identify and describe the uses, and components of a dozer.
    a. Identify and describe common uses and types of dozers.
    b. Identify and describe major parts of a dozer.
    c. Identify and describe dozer instrumentation.
    d. Identify and describe dozer controls.
    e. Identify and describe common dozer blades.
    f. Identify and describe common dozer attachments.
2. Identify and describe safety, inspection, and service guidelines associated with a dozer.
    a. Describe guidelines associated with dozer safety.
    b. Describe prestart inspection procedures.
    c. Describe preventative maintenance requirements.
3. Describe basic startup and operating procedures for a dozer.
    a. Describe startup, warm-up, and shutdown procedures.
    b. Describe basic maneuvers and operations.
    c. Describe common work activities.
    d. Describe activities involving special attachments.

Module Six (22304-14) – Excavators

1. Identify and describe the types, uses, and components of excavators.
    a. Identify and describe common types of excavators.
    b. Identify and describe common uses of excavators.
    c. Identify and describe major parts of excavators.
    d. Identify and describe excavators instrumentation and control.

    e. Identify and describe common excavator buckets and attachments.
2. Identify and describe safety, inspection and service guidelines associated with an excavator.
    a. Describe guidelines associated with excavator safety.
    b. Describe prestart inspection procedures.
    c. Describe preventative maintenance requirements.
3. Describe basic startup and operating procedures for a track-mounted hydraulic excavator.
    a. Describe startup, warm-up, and shutdown procedures.
    b. Describe basic maneuvers and operations.
    c. Describe common work activities.
    d. Describe activities involving special attachments.

Course Number and Name: **CEV 1426 Equipment Operation II**

Description: Operation of the dozer, loader, and excavator. Includes the controls and basic skills performed with each machine and completing assignments by verbal and written instructions.

Hour Breakdown:

Semester Hours	Lecture	Lab	Contact Hours
6	1	10	165

Prerequisite: Instructor Approved

Student Learning Objectives:

1. Demonstrate the ability to safely operate the dozer.
    a. Explain the safety precautions of operating the dozer.
    b. Demonstrate the use of the various controls on a dozer.
    c. Demonstrate clearing and grubbing procedures.
2. Demonstrate the ability to safely operate an end loader.
    a. Explain the safety precautions when operating an end loader.
    b. Demonstrate the use of the various controls on an end loader.
    c. Demonstrate the procedures to back fill trenches.
    d. Demonstrate procedures for loading a truck.
    e. Transport materials.
3. Demonstrate the ability to safely operate an excavator.
    a. Explain the safety precautions of operating an excavator.
    b. Demonstrate the use of the various controls on an excavator.
    c. Dig a trench (or similar excavation) to specifications.
    d. Demonstrate truck loading procedures.
4. Demonstrate the ability to load various equipment (dozer, loader, and excavator) for transportation.
    a. Explain safety precautions when loading and unloading equipment.
    b. Demonstrate how to load various equipment for transportation.
    c. Demonstrate how to unload various equipment from transportation.

NCCER
Heavy Equipment Operations – Level II
Module One (22206-13) – Rough Terrain Forklifts

1. Identify and describe the components of a rough-terrain forklift.
    a. Identify and describe chassis components.
    b. Identify and describe the controls.
    c. Identify and describe the instrumentation.
    d. Identify and describe the attachments.
2. Describe the prestart inspection requirements for a rough-terrain forklift.
    a. Describe prestart inspection procedures.
    b. Describe preventive maintenance requirements.
3. Describe the startup and operating procedures for a rough-terrain forklift.
    a. State rough-terrain forklift-related safety guidelines.
    b. Describe startup, warm-up, and shutdown procedures.
    c. Describe basic maneuvers and operations.
    d. Describe related work activities.

NCCER

Heavy Equipment Operations – Level III

Module Three (22303-14) - Backhoes

1. Identify and describe the common uses and types of backhoes.
    a. Describe common uses of a backhoe.
    b. Identify types and configurations of backhoes.
2. Identify and describe the components, controls, and attachments on a typical backhoe.
    a. Describe the major parts of a backhoe.
    b. Describe the instruments and controls.
    c. Describe the backhoe controls.
    d. Describe common backhoe attachments.
3. Identify and describe safety, inspection, and service guidelines associated with a backhoe.
    a. Describe rules pertaining to safety.
    b. Describe daily inspection checks.
    c. Describe the servicing requirements for a backhoe.
4. Describe basic operating procedures for a backhoe.
    a. Identify factors for effective backhoe operation.
    b. Identify steps for preparing to work with a backhoe.
    c. Identify steps for performing basic maneuvers with a backhoe.
5. Identify and describe common work activities for a backhoe.
    a. Describe loading from a stockpile with a backhoe.
    b. Describe trenching and loading with a backhoe.
    c. Describe demolition using the hydraulic breaker.
    d. Describe setting pipe using a backhoe.
    e. Describe excavating footings and foundations with a backhoe.
    f. Describe working with a backhoe in confined or unstable areas.
    g. Describe basic procedures for roading and transporting a backhoe.

Module Four (22310-14) – Off-Road Dump Trucks

1. Identify and describe basic types, uses, and components of off-road dump trucks.
    a. Identify and describe rigid dump trucks.
    b. Identify and describe articulated dump trucks.
    c. Identify and describe off-road truck instrumentation.
    d. Identify and describe off-road truck control systems.
2. Identify and describe safety, inspection, and service guidelines associated with off-road dump trucks.
    a. Describe guidelines associated with off-road truck safety.
    b. Describe prestart inspection procedures.
    c. Describe preventative maintenance requirements.
3. Describe basic startup and operating procedures for off-road dump trucks.
    a. Describe startup, warm-up, and shutdown procedures.
    b. Describe safe driving maneuvers and loading and dumping procedures.

Module Seven (22305-14) – Motor Graders

1. Identify and describe uses, and components of a motor grader.
    a. Identify and describe common uses of a motor grader.
    b. Identify and describe major parts of a motor grader.
    c. Identify and describe motor grader instrumentation.

    d. Identify and describe motor grader controls
    e. Identify and describe common motor grader attachments.
2. Identify and describe safety, inspection, and service guidelines associated with a motor grader.
    a. Describe guidelines associated with motor grader safety.
    b. Describe prestart inspection procedures.
    c. Describe preventative maintenance requirements.
3. Describe basic startup and operating procedures for a motor grader.
    a. Describe startup, warm-up, and shutdown procedures.
    b. Describe basic maneuvers and operations.
    c. Describe common work activities.

Course Number and Name: **CEV 1514 Grade Work I**

Description: Setting and checking of grade stakes that are used on job sites. Instruction and practice of transferring elevations are also included.

Hour Breakdown:

Semester Hours	Lecture	Lab	Contact Hours
4	1	6	105

Prerequisite: Instructor Approved

Student Learning Objectives:

1. Identify and transfer elevations.
    a. Identify the procedures for the transfer of elevations.
    b. Transfer elevations.
2. Demonstrate the ability to identify and set grade.
    a. Demonstrate the ability to use a hand level and/or tripod level.
    b. Identify and correctly read grade stakes and perform assigned tasks.

NCCER
Core
Module Two (00102-15) – Introduction to Construction Math

1. Identify whole numbers and demonstrate how to work with them mathematically.
    a. Identify different whole numbers and their place values.
    b. Demonstrate the ability to add and subtract whole numbers.
    c. Demonstrate the ability to multiply and divide whole numbers.
2. Explain how to work with fractions.
    a. Define equivalent fractions and show how to find lowest common denominators.
    b. Describe improper fractions and demonstrate how to change an improper fraction to a mixed number.
    c. Demonstrate the ability to add and subtract fractions.
    d. Demonstrate the ability to multiply and divide fractions.
3. Describe the decimal system and explain how to work with decimals.
    a. Describe decimals and their place values.
    b. Demonstrate the ability to add, subtract, multiply, and divide decimals.
    c. Demonstrate the ability to convert between decimals, fractions, and percentages.
4. Identify various tools used to measure length and show how they are used.
    a. Identify and demonstrate how to use rulers.
    b. Identify and demonstrate how to use measuring tapes.
5. Identify and convert units of length, weight, volume, and temperature between the imperial and metric systems of measurement.
    a. Identify and convert units of length measurement between the imperial and metric systems.
    b. Identify and convert units of weight measurement between the imperial and metric systems.
    c. Identify and convert units of volume measurement between the imperial and metric systems.
    d. Identify and convert units of temperature measurement between the imperial and metric systems.
6. Identify basic angles and geometric shapes and explain how to calculate their area and volume.

a. Identify various types of angles.
b. Identify basic geometric shapes and their characteristics.
c. Demonstrate the ability to calculate the area of two-dimensional shapes.
d. Demonstrate the ability to calculate the volume of three-dimensional shapes.

Module Five (00104-15) – Introduction to Construction Drawings

1. Identify and describe various types of construction drawings, including their fundamental components and features.
    a. Identify various types of construction drawings.
    b. Identify and describe the purpose of the five basic construction drawing components.
    c. Identify and explain the significance of various drawing elements, such as lines of construction, symbols, and grid lines.
    d. Identify and explain the use of dimensions and various drawing scales.
    e. Identify and describe how to use engineer's and architect's scales.

Module Nine (00109-15) – Introduction to Material Handling

1. Describe the basic concepts of material handling and common safety precautions.
    a. Describe the basic concepts of material handling and manual lifting.
    b. Identify common material-handling safety precautions.
    c. Identify and describe how to tie knots commonly used in material handling.
2. Identify various types of material handling equipment and describe how they are used.
    a. Identify non-motorized material-handling equipment and describe how they are used.
    b. Identify motorized material-handling equipment and describe how they are used.

NCCER
Heavy Equipment Operations – Level I
Module Seven (22106-12) – Grades

1. Explain the terms used in grade work.
2. Identify types of stakes and explain markings on grade stakes and benchmark (BM) stakes.
3. Identify equipment used by operators to check stakes.
4. Explain different types of slopes and slope ratio.
5. Check horizontal and vertical distance of cut and fill slope stakes.
6. Check finish subgrade on a cross slope.

Course Number and Name: **CEV 1524 Grade Work II**

Description: Additional instruction and practice regarding the setting and checking grades. Also instruction and practice on the compaction of various materials..

Hour Breakdown:

Semester Hours	Lecture	Lab	Contact Hours
4	1	6	105

Prerequisite: Instructor Approved

Student Learning Objectives:

Description:

1. Identify and set grade as needed.
    a. Use a hand level and/or tripod level to set grade stakes.
    b. Identify and correctly read grade stakes and perform assigned tasks.
    c. Read plans and blueprints, and determine cut and fill information.
    d. Describe a laser level, and explain how it is used to measure distance.
    e. Describe the Global Positioning Satellite (GPS) system, and describe how it is used in surveying work.
2. Identify materials, and perform compaction methods.
    a. Identify the composition of materials in a cross section.
    b. Explain various techniques for compacting the material.
    c. Evaluate and compact the on-site materials to specifications.

NCCER
Heavy Equipment Operations – Level I
Module Six (22201-12) – Introduction to Earthmoving

1. Identify and explain earthmoving terms and methods.
2. Describe how to safely set up and coordinate earthmoving operations.
3. Identify and explain earthmoving operations.
4. Identify and explain soil stabilization methods.
5. Identify the best equipment for performing a given earthmoving operation.
6. List, in the correct order, the steps involved in an earthmoving operation.

NCCER
Heavy Equipment Operation Level II
Module Nine (22210-13) – Site Work

1. Describe the safety practices associated with site grading work.
    a. Explain the purpose of a site safety program.
    b. Describe why safety inspections and investigations are important.
    c. Explain how hazardous materials are controlled on a job site.
    d. Describe safety practices associated with trenching and excavations.
    e. Describe how to prepare heavy equipment for transporting.
2. Describe the methods used to control water on job sites.

   a. Explain the importance of maintaining proper drainage on a job site.
   b. Describe the methods used to control groundwater and surface water.
   c. Describe the safety practices and construction methods used when working around bodies of water.
3. Explain how grades are established on a job site.
   a. Describe how to set grades from a benchmark.
   b. Describe how grades are set for highway construction.
   c. Describe how grades are set for building construction.
   d. Explain how grading operations are performed.
   e. Describe the use of stakeless and stringless grading systems.
4. Describe grading and installation practices for pipe-laying operations.
   a. Explain how grades are established for pipelaying operations.
   b. Describe the equipment and methods used to lay pipe.

RECOMMENDED TOOLS AND EQUIPMENT SAFETY AND HEALTH TECHNOLOGY

CAPITALIZED ITEMS

1. Boring equipment
2. Computers (2)
3. Dozer (1)
4. End loader (1)
5. Excavator (1)
6. Forklift (1)
7. Large-size crawler tractors (2)
8. Laser lever (1)
9. Low-boy trailer and tractor (1)
10. Medium-size crawler tractors (3)
11. Off-road dump truck (1)
12. On-road dump truck (1)
13. Power backhoes (2)
14. Printers (2)
15. Road grader (1)
16. Self-loading scrapers (2)
17. Sheepfoot rollers (2)
18. Utility tractor (1)

NON-CAPITALIZED ITEMS

1. 1/2-in. drive impact wrench (1)
2. 1/2-in. drive socket set, 7/16 in. – 1 1/4 in. with extension, ratchet, and pull handle (1)
3. 1/2-in. electric drill with set of bits per drill (2)
4. 3/4-in. drive impact wrench (1)
5. 3/4-in. drive socket set, 7/8 in. – 2 in. with extension, ratchet, and pull handle (1)
6. 10-in. groove joint pliers (2)
7. 100-ft heavy-duty extension cords (2)
8. 1-gal. oil can (1)
9. 1-gal. water cans (4)
10. 20-ton bottle jack (1)
11. Two-way base set radio (1)
12. Two-way hand-held radio (6)
13. 3/8-in. drive socket set, 1/4 in. – 7/8 in. with extension and ratchet (1)
14. 4 1/2-in. electric hand grinder (1)
15. 48-quart ice chest (1)
16. 5-gal. water cooler with cup dispenser (1)
17. 6-in. slip joint pliers (2)
18. 6 1/2-in. diagonal pliers (2)
19. 6 1/2-in. long nose pliers (2)
20. 8-lb sledge hammer (1)
21. 8-in. locking pliers (2)
22. Adjustable wrenches, 10 in., 12 in., and 18 in. (1 of each)
23. Air compressor (1)
24. Ball-peen hammers, 8–12 oz, 16–20 oz, 24–32 oz (3)
25. Battery tester (1)
26. Bench grinders, 1/2-in. hp (2)
27. Binders, each, 1/4 in., 3/8 in., and 1/2 in. (3)

28. Chains, each, 1/4 in, 3/8 in., and 1/2 in., 15-ft length (3)
29. Circuit tester (1)
30. Creepers (2)
31. Drill press, 1/2-in. chuck (1)
32. Dumpy level with tripod, Philadelphia rod (1)
33. Electric arc welder (1)
34. Floor jack, 20-ton (1)
35. Hacksaws with spare blades (2)
36. Hand grease guns (2)
37. Hand level (1)
38. Heavy-duty battery charger, 6-V and 12-V (1)
39. Heavy-duty booster cables (2)
40. Heavy-duty flashlights (2)
41. Heavy-duty trouble lights (2)
42. Hydraulic press, 20-ton (1)
43. Jack stands, 5-ton (6)
44. Large funnels (4)
45. Metal cabinets (3)
46. Metal locking cabinet (1)
47. Metal toolbox (1)
48. Metal work tables with 12-in. vises (4)
49. Oil cans, quart size (4)
50. Oxygen-acetylene welder (1)
51. Pipe wrenches – 6 in., 12 in., 18 in. (1 of each)
52. Pull cable hoist, 1/4-in. cable (1)
53. Roller seats (4)
54. Seal pullers (2)
55. Set of three sizes of gear pullers (1)
56. Set, Allen wrenches (1)
57. Set, flaring tool and cutter (1)
58. Set, flat blade screwdrivers (1)
59. Set, Phillips screwdrivers (1)
60. Set, punch and chisel set (1)
61. Set, split fuel line wrenches (1)
62. Set, tap and die (1)
63. Sets, combination wrenches, 1/4 in. – 2 in. (2)
64. Shovels, sharp point (4)
65. Shovels, sharpshooter (4)
66. Steam cleaner (1)
67. Torque wrench (1)
68. Wire brushes (2)

Recommended Instructional Aids

It is recommended that instructors have access to the following items:

1. Cart, AV (for overhead projector) (1)
2. Cart, AV (for TV–VCR) (1)
3. Computer with operating software with multimedia kit (1)
4. Video out (microcomputer to TV monitor) (1)
5. Projection equipment

CURRICULUM DEFINITIONS AND TERMS

- Course Name – A common name that will be used by all community colleges in reporting students

- Course Abbreviation – A common abbreviation that will be used by all community and junior colleges in reporting students

- Classification – Courses may be classified as the following:
    - Career Certificate Required Course – A required course for all students completing a career certificate.
    - Technical Certificate Required Course – A required course for all students completing a technical certificate.
    - Technical Elective – Elective courses that are available for colleges to offer to students.

- Description – A short narrative that includes the major purpose(s) of the course

- Prerequisites – A listing of any courses that must be taken prior to or on enrollment in the course

- Corequisites – A listing of courses that may be taken while enrolled in the course

- Student Learning Outcomes – A listing of the student outcomes (major concepts and performances) that will enable students to demonstrate mastery of these competencies

The following guidelines were used in developing the program(s) in this document and should be considered in compiling and revising course syllabi and daily lesson plans at the local level:

- The content of the courses in this document reflects approximately 75% of the time allocated to each course. The remaining 25% of each course should be developed at the local district level and may reflect the following:
    - Additional competencies and objectives within the course related to topics not found in the state framework, including activities related to specific needs of industries in the community college district
    - Activities that develop a higher level of mastery on the existing competencies and suggested objectives
    - Activities and instruction related to new technologies and concepts that were not prevalent at the time the current framework was developed or revised
    - Activities that include integration of academic and career–technical skills and course work, school-to-work transition activities, and articulation of secondary and postsecondary career–technical programs
    - Individualized learning activities, including work-site learning activities, to better prepare individuals in the courses for their chosen occupational areas

- Sequencing of the course within a program is left to the discretion of the local college. Naturally, foundation courses related to topics such as safety, tool and equipment usage, and other fundamental skills should be taught first. Other courses related to specific skill areas and related academics, however, may be sequenced to take advantage of seasonal and climatic conditions, resources located outside of the school, and other factors. Programs that offer an Associate of Applied Science Degree must include all of the required Career Certificate courses, Technical Certificate courses **AND** a minimum of 15 semester hours of General Education Core Courses. The courses in the General Education Core may be spaced out over the entire length of the program so that students complete some academic and Career Technical courses each semester. Each community college specifies the actual courses that are required to meet the General Education Core Requirements for the Associate of Applied Science Degree at their college.

- In order to provide flexibility within the districts, individual courses within a framework may be customized by doing the following:

- Adding new student learning outcomes to complement the existing competencies and suggested objectives in the program framework
- Revising or extending the student learning outcomes
- Adjusting the semester credit hours of a course to be up 1 hour or down 1 hour (after informing the Mississippi Community College Board [MCCB] of the change)

COURSE CROSSWALK

CONSTRUCTION EQUIPMENT TECHNOLOGY

Note: Courses that have been added or changed in the 2016 curriculum are highlighted.

Existing			Revised		
2010 MS Curriculum Framework			**2016 MS Curriculum Framework**		
Course Number	**Course Title**	**Hours**	**Course Number**	**Course Title**	**Hours**
CEV 1212	Safety I	2	CEV 1212	Safety I	2
CEV 1313	Service and Preventative Maintenance	3	CEV 1313	Service and Preventative Maintenance	3
CEV 1416	Equipment Operation	6	CEV 1416	Equipment Operation	6
CEV 1514	Grade Work I	4	CEV 1514	Grade Work I	4
CEV 1222	Safety II	2	CEV 1222	Safety II	2
CEV 1323	Service and Preventative Maintenance	3	CEV 1323	Service and Preventative Maintenance	3
CEV 1426	Equipment Operation II	6	CEV 1426	Equipment Operation II	6
CEV 1524	Grade Work II	4	CEV 1524	Grade Work II	4

NCCER Standards Crosswalk

NCCER Core and Levels 1-3 Mapped to Construction Equipment Technology Curriculum

Standard Name	NCCER Module Number & Name	Mapped Construction Equipment Course Name	Note:
NCCER Core	00101-15 Basic Safety	CEV 1212 Safety I	
	00102-15 Introduction to Construction Math	CEV 1514 Grade Work I	
	00103-15 Introduction to Hand Tools	CEV 1212 Safety I	
	00104-15 Introduction to Power Tools	CEV 1212 Safety I	
	00105-15 Introduction to Construction Drawings	CEV 1212 Safety I; CEV 1514 Grade Work I	
	00106-15 Introduction to Basic Rigging		Not Included – Optional per NCCER
	00107-15 Basic Communication Skills	CEV 1222 Safety II	
	00108-15 Basic Employability Skills	CEV 1416 Equipment Operation I	
	00109-15 Introduction to Material Handling	CEV 1514 Grade Work I	
NCCER Heavy Equipment Operations Level I	22101-12 Orientation to the Trade	CEV 1416 Equipment Operation I	
	22102-12 Heavy Equipment Safety	CEV 1212 Safety I	
	22103-12 Identification of Heavy Equipment	CEV 1416 Equipment Operation I	
	22104-12 Basic Operational Techniques	CEV 1416 Equipment Operation I	
	22105-12 Utility Tractors	CEV 1313 Service and Preventative Maintenance I	
	22201-12 Introduction to Earthmoving	CEV 1524 Grade Work II	
	22106-12 Grades	CEV 1514 Grade Work I	
NCCER Heavy Equipment Operations Level II	22206-13 Rough-Terrain Forklifts	CEV 1426 Equipment Operation II	
	22202-13 On-Road Dump Trucks	CEV 1323 Service and Preventative Maintenance II	
	22207-13 Excavation Math		Not Included
	22209-13 Interpreting Civil Drawings		Not Included
	22210-13 Site Work	CEV 1222 Safety II; CEV 1524 Grade Work II	
	22308-13 Soils		Not Included
	22213-13 Skid Steers		Not Included
	22205-13 Loaders		Not Included
	22204-13 Scrapers		Not Included
NCCER Heavy Equipment Operations Level III	22307-14 Finishing and Grading		Not Included
	22203-14 Compaction Equipment		Not Included
	22303-14 Backhoes	CEV 1426 Equipment Operation II	
	22310-14 Off-Road Dump Trucks	CEV 1426 Equipment Operation II	
	22302-14 Dozers	CEV 1416 Equipment Operation I	
	22304-14 Excavators	CEV 1416 Equipment Operation I	
	22305-14 Motor Graders	CEV 1426 Equipment Operation II	