HEAVY DIESEL CONSTRUCTION TECHNOLOGY

The Heavy Diesel Construction program prepares individuals to apply technical knowledge and skills in the field of heavy construction equipment, and in the general maintenance and repair of such equipment, along with the academic skills to be a valuable employee. Instruction includes foundational courses in theory and hands-on skills practice in safety standards, power trains, diesel engines, and welding.

Specialized courses for diesel construction include instruction in inspection, maintenance, and repair of tracks, wheels, brakes, operating controls, pneumatic and hydraulic systems, electrical circuitry, engines and techniques of welding and brazing. Machines and equipment in the lab include Case wheel loader, loader backhoe, and skid steers. Tier 4 and 3 Fiat engines plus engine cut-aways are provided for skills practice with tear-down, operations and diagnostics. Students are given the option to serve an internship with area dealers and may qualify for company sponsorship for their second term. This program will offer students preparation to test for the industry-recognized credentials listed below.

Program Information

- Required Math Score: Level 4
- Required Reading Score: Level 4
- Program Start (semesters): August, January
- Financial Aid available (for post-secondary students only): Yes
- Veteran Benefits Eligible (for post-secondary students only): Yes
- Industry-recognized credentials: ASE Brakes; ASE Diesel Engines; ASE Electrical/Electronic Systems; ASE Suspension & Steering; OSHA

Certificate Requirements

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Total Hours 51

DEM 111 Shop Skills & Safety Fundament (1)
The focus of this course is the ability to safely work with shop equipment commonly found in a diesel servicing and repair facility. Emphasis is using, maintain and servicing shop equipment such as hoists, lifts, safety stands, cranes, presses and grinders. The location and usage of personal protective equipment (PPE) and of common hand tools is included.

DEM 113 Electrical/Electronic Systems (5)
Systems studies the principles of electricity through operations and testing procedures and provides an introduction to electronics. Diagnostics and repair of starting and charging electrical systems are covered, in addition to practical applications of the principles of electricity. Electronic management programs are referenced and studied.

DEM 116 Workplace Skills (1)
Overview and practice of general workplace skills including personal effectiveness, time management, teamwork, and critical thinking in the workplace. The course incorporates skills development in the following three units: overview of diesel technology, workplace communication and customer service, and job application.

DEM 123 Hydraulics (5)
Principles of basic hydraulics, introduction to hydraulics systems: open center, closed center, and pressure and flow compensating type systems.

DEM 134 Scanner Diagnostics (1)
Scanner Diagnostics focuses on the hands-on application of aftermarket diagnostic equipment and tools such as the Snap-on Pro-link and Modis as well as OEM systems utilized by Cummins, CASE and others.

DEM 138 Suspension and Steering (3)
Suspension and Steering addresses the theory, operations and troubleshooting of various steering and suspension system components.

DEM 142 Welding for Diesel (3)
Introduction to basic concepts of general welding; hands-on lab activities to apply knowledge and develop skills in the following areas: shop safety, cutting (oxy/acetylene) SMAW (Shielded Metal Arc Welding).

DEM 143 Brakes (3)
Brakes will cover the theory and operations of hydraulic and air brake systems, teaching troubleshooting, disassembly, inspection and adjustments of hydraulic and air brake systems, including ABS.

DEM 144 Brakes for Construction (2)
Brakes will cover the theory and operations of hydraulic and air brake systems, teaching troubleshooting, disassembly, inspection and adjustments of hydraulic and air brake systems, including ABS. Common braking system utilized on construction equipment are highlighted.

DEM 146 Welding for Diesel (4)
Introduction to basic concepts of general welding; hands-on lab activities to apply knowledge and develop skills in the following areas: shop safety, cutting (oxy/acetylene) SMAW (Shielded Metal Arc Welding). Participants will work independently and as small teams in completing the lab activities.

DEM 147 Welding for Locomotive (2)
The course includes basic oxy-acetylene heating, cutting, brazing and welding and basic shielded Metal Arc Welding (SMAW) typically used in the railroad industry. Safety and set-up are emphasized and the student will perform the fundamentals of the processes as they produce acceptable welds and cuts.
DEM 148 Advanced Electrical/Electronic Systems (5)
Construction machine electrical schematic reading, troubleshooting, diagnosis, and repair of monitoring systems, instrumentation, and other specialized electronic and computer-controlled equipment on CASE Construction machinery and heavy equipment. Students will determine proper use of wiring schematics to troubleshoot electrical systems on light through heavy vehicles.

DEM 150 EST Diagnostics (1)
The CASE EST (Electronics Scan Tool) Diagnostics course on the hands-on application of CASE and aftermarket diagnostic equipment and tools such as the Snap-on Pro-link and Modis as well as OEM systems utilized by Cummins, CASE and others.

DEM 202 Advanced Machine Electrical (3)
Construction machine electrical schematic reading, troubleshooting, diagnosis, and repair of monitoring systems, instrumentation, and other specialized electronic and computer-controlled equipment on CASE Construction machinery and heavy equipment.

DEM 203 Locomotive FRA (3)
This course is the fourth in a series of four courses in Locomotive Mechanics. This course is designed to introduce the student to the Federal Railway Administration and Department of Transportation Code of Federal Regulations Title 49, Parts 209, 218, 229, 231, and 232.

DEM 204 Advanced Machine Electrical (4)
Knowledge and skills learned in DEM113 are the foundation for the study of CASE Construction equipment electrical systems such as monitoring systems, instrumentation, lighting and other specialized electronic and computer-controlled systems. Troubleshooting, diagnosis, and repair of these systems is performed utilizing electrical testers, meters, and scan tools such as the CASE EST (Electronic Service Tool). The use of wiring schematics and repair manuals in the diagnosis process is emphasized. Prerequisite: DEM113 Electrical Electronics Systems

DEM 206 Basic GE Mechanical (3)
This is the second in a series of four courses in Locomotive Mechanics. This course is designed to introduce the student to the basic operation, maintenance, repair requirements and trouble shooting for GE diesel engines and support systems.

DEM 208 Basic EMD Mechanical (3)
This is the first in a series of four courses in Locomotive Mechanics. This course is designed to introduce the student to the basic operation, maintenance, repair requirements and trouble shooting for EMD diesel engines and support systems.

DEM 212 EST & Telematic Systems (3)
Theoretical and practical application of CASE Construction EST (Electronic Service Tool) and telematic systems as related to construction equipment; emphasis on software, product information, calibration and hardware functions.

DEM 221 Drive Trains (3)
The Drive Trains 1 course will include classroom and/or shop exercises in: characteristics and principles of power trains units. Specific topics include introduction to diesel drive trains, drive shafts, power take-offs, and standard transmissions. Also the procedures in disassembly, wear analysis, and failure analysis. Instruction will be included in these types of transmissions and differentials: Mack, Rockwell Eaton and Dana Spicer. Students will be expected to observe and comply with all safety rules and regulations.

DEM 223 Advanced Hydraulic Systems (2)
This course includes instruction on Hydraulic and hydrostatic systems used on construction equipment; diagnosing and testing to solve system problems; interpretation of fluid hydraulic schematic and diagrams; and electronic and computer-controlled systems.

DEM 224 Advanced Hydraulic Systems (3)
Knowledge and skills learned in DEM123 are the foundation for the study of the hydraulic and hydrostatic systems used on CASE construction equipment. Diagnosing and testing to solve system problems; interpretation of fluid hydraulic schematic and diagrams; and electronic and computer-controlled systems are all covered. Prerequisite DEM123 Hydraulics

DEM 230 Brakes Service (2)
The focus of this course is hands-on work on common light, medium and heavy truck hydraulic and air brake systems and components. Basic operating theory is covered at the level required to understand or perform the operation, maintenance, inspection, diagnosis, wear pattern interpretation, failure analysis, reconditioning, disassembly, re-assembly of systems.

DEM 231 Diesel Engines I (5)
Diesel Engines I introduces the theory of operation and the use of the engine’s mechanical components; disassembling, inspecting, measuring, reassembling and performing maintenance procedures on diesel engines.

DEM 232 Service Department Implementation (3)
Simulation of a service department including diagnostic work, disassembly work, repair work and assembly work on CASE CONSTRUCTION equipment. Students will practice accurate and precise labor documentation.

DEM 233 Locomotive Air Brake (3)
This course is the third in a series of four courses in Locomotive Mechanics. It is designed to provide the student an introduction to the operation, testing, maintenance, and troubleshooting for 26L and 30 ACDW locomotive air brake systems. This course also emphasizes FRA air brake requirements applicable to locomotives.

DEM 238 Suspension & Steering Service (2)
The focus of this course is hands-on work on common light, medium and heavy truck suspension and steering systems and components. Basic operating theory is covered at the level required to understand or perform the operation, maintenance, inspection, diagnosis, wear pattern interpretation, failure analysis, reconditioning, disassembly, re-assembly of systems including a basic alignment. Basic usage of Oxyacetylene equipment is also covered.

DEM 241 Advanced Diesel Engines (5)
Advanced Diesel Engines course will include classroom and/or shop exercises: basic principles of the various engine systems, the disassembly and inspection, reconditioning of component parts to include various fuel systems. In addition, engine diagnosis and maintenance will be discussed and performed in various engine systems. Students will be expected to observe and comply with all safety rules.

DEM 242 Heavy Equipment I (4)
Introduction to heavy highway trade of trucks and heavy equipment. Content includes: Setup, repair and operational field testing of new and used construction equipment; procedures and components of trucks, heavy equipment, below grade construction, earthmoving, plant operations, paving, and structures.
DEM 243  BNSF Worksite Observation  (1)
This one hour Locomotive-Mechanic worksite observation is designed to allow the Locomotive Diesel students to view the engine components at the worksite to coincide with the courses for EMD and GE diesel engines and support systems in the NARS curriculum.

DEM 244  Heavy Equipment Operation  (2)
Operation and operator-level service and inspection of typical heavy construction equipment such as bulldozers, backhoes, loaders, track hoes, uni-loaders, and off road trucks. Pre-operation inspections, setup, and operational field testing of new and used construction equipment.

DEM 248  Drive Trains II  (3)
Drive Trains II builds on the knowledge, skills and abilities obtained in DEM221. Systems utilized in light, medium and heavy truck drive trains including: automatic transmissions, drive axles, procedures in disassembly/assembly, wear analysis, and failure analysis in drive trains, pressure and flow testing of drive train systems, timing of drive train systems, and theory and operation of final drives and shuttles are included. Prerequisite: DEM221 Drive Trains

DEM 250  Engine Performance  (2)
Engine Performance covers the engine control and emission control systems such as fuel injection, air induction, exhaust, exhaust gas treatments/filters utilized on light, medium and heavy diesel trucks. Students are introduced to diagnostic equipment and tools such as the Snap-on Pro-link and Modis as well as OEM systems utilized by Cummins, CASE and others.

DEM 252  Power Trains for Construction  (3)
Drive trains and components of construction equipment, clutch systems, transaxles, differentials, axles; emphasis on disassembly, reassembly and component identification; pressure and flow testing of powertrains used in construction equipment; calibrations of transmissions, theory and operations of final drives and shuttles. Emphasis: Understanding of operation of mechanical, power shift, power shuttle, S type power shift, and hydrostatic transmissions to include tracking and adjustments.

DEM 255  Engine Performance  (3)
Provides theory, diagnosis, and service of diesel fuel and emission systems. Included are opportunities to analyze fuel and emission components and systems with emphasis on practical application of computer controlled fuel and emission systems.

DEM 258  Drive Trains II  (2)
The Power Trains 2 course will include classroom and/or shop exercises in the following courses in the Power Trains unit: automatic transmission and torque converters, clutches, drive axles, special drives; and procedures in disassembly, wear analysis, and failure analysis in power trains. Instruction will include these types of transmissions and differentials: Mack, Rockwell Eaton, Arvin Meritor, and Dana Spicer. Students will be expected to observe and comply with all safety rules and regulations.

DEM 268  Aux Power Units/Refrigeration  (2)
The function and purpose of Auxiliary Power Units (APUs) that power system when the primary engine is not in use, such as refrigeration units on tractor-trailers, are covered. This course includes basic air conditioning service, diagnostic, and repair on applications used in the diesel field and Section 509 Refrigeration certification by the Mobile Air Condition Society (MACS).

DEM 272  Auxiliary Power Units  (2)
Course emphasizes the study and practices of additional and exterior units that are crucial to the diesel industry, such as machine hydraulics and auxiliary power units and trailers.