



8674

DIESEL ENGINE FUNDAMENTALS
AND SERVICE (11A)

30S/30E/30M

A Heavy Duty Equipment Technician Course

8674: DIESEL ENGINE FUNDAMENTALS AND SERVICE (11A) 30S/30E/30M

Course Description

A student wanting to develop skills in the heavy duty equipment service and repair industry must have knowledge of the basic principles of diesel engines, the inner workings and relations of the engine components, and how those relate to vehicle operation. The student will learn the procedures to service, repair, and replace engines and their components.

Cross-curricular learning outcomes, or essential skills from subject areas including, but not limited to, information and communication technologies, science, English language arts, and mathematics, are to be integrated into the authentic learning activities of the course.

The curriculum is not sequential. For instructional purposes, the sequence of learning outcomes can vary based on the learning activities within the course.

Goal 1: Describe and apply appropriate **safety** practices for heavy duty equipment technicians.

GLO 1.1: Describe and apply appropriate **safety** practices for heavy duty equipment technicians.

- SLO 11A.1.1.1 Describe and apply appropriate health and safety practices as they pertain to diesel engine fundamentals and service.
- SLO 11A.1.1.2 Create and maintain a safe working environment as it applies to diesel engine fundamentals and service.
- SLO 11A.1.1.3 Describe safety practices, Workplace Hazardous Material Information System (WHMIS), and preventative maintenance. (A1.01)
- SLO 11A.1.1.4 Describe cab, canopy, and ROP/FLOP components, and their operation, inspection, repair, and replacement procedures. (A1.02)
- SLO 11A.1.1.5 Describe the servicing of fire suppression systems. (A1.03)
- SLO 11A.1.1.6 Describe forklift operation and safety. (A1.04)
- SLO 11A.1.1.7 Describe restraint systems and their components, and inspection procedures, manufacturers' tests, and repair/replacement of them. (A1.05)
- SLO 11A.1.1.8 Demonstrate safety procedures for hydraulic hydrostatic system servicing.

SLO 11A.1.1.9	Demonstrate safety procedures for HVAC system servicing.
SLO 11A.1.1.10	Describe the importance of using personal protective equipment (PPE). (TSA 16)
SLO 11A.1.1.11	Describe safety procedures when handling wheels, tires, and hubs. (F1.04)
SLO 11A.1.1.12	Maintain a safe and organized work environment.
SLO 11A.1.1.13	Document an understanding of the safe use of heavy duty tools and equipment.
SLO 11A.1.1.14	Describe and apply the appropriate health and safety practices as they pertain to transmission systems, drivelines, transfer cases, and power takeoffs.

GLO 1.2: Demonstrate knowledge of the *Trade Safety Awareness Manual*.

No applicable SLOs.

Goal 2: Identify, select, use, and maintain **tools, equipment, materials, and consumables**.

GLO 2.1: Identify, select, use, and maintain **tools, equipment, materials, and consumables**.

SLO 11A.2.1.1	Identify, select, use, and maintain tools, equipment, materials, and consumables used in diesel engine fundamentals and service.
SLO 11A.2.1.2	Describe and use basic hand tools, basic shop tools, and fasteners. (D1.01)
SLO 11A.2.1.3	Select and use diagnostic tools, such as infrared temp guns, calipers, and ultrasonic cleaners.

Goal 3: Describe and demonstrate equipment **access/transport** procedures.

GLO 3.1: Describe and demonstrate equipment **access/transport** procedures.

SLO 11A.3.1.1	Describe lifting equipment. (A2.01)
SLO 11A.3.1.2	Describe safety practices that apply to lifting and to the maintenance of lifting equipment. (A2.02)
SLO 11A.3.1.3	Describe towing, transporting, and coasting precautions. (A2.03)

SLO 11A.3.1.4	Describe manual lifting procedures using correct body mechanics. (A2.04)
SLO 11A.3.1.5	Describe lifting equipment construction, grading, sizing, and limits. (A2.05)
SLO 11A.3.1.6	Select the correct equipment for rigging typical loads. (A2.06)
SLO 11A.3.1.7	Describe wire rope applications. (A2.07)
SLO 11A.3.1.8	Describe winch design, and operational and troubleshooting procedures. (A2.08)

Goal 4: Diagnose and repair problems with heavy duty equipment systems.

GLO 4.1: Diagnose problems with heavy duty equipment systems.

SLO 11A.4.1.1	Diagnose issues related to diesel engines.
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GLO 4.2: Describe and repair problems with heavy duty equipment.

SLO 11A.4.2.1	Describe diesel engine systems and repair procedures.
SLO 11A.4.2.2	Repair diesel engine systems.
SLO 11A.4.2.3	Describe and install sealing devices, and perform seal service. (D1.02)
SLO 11A.4.2.4	Explain engine principles. (D1.03)
SLO 11A.4.2.5	Explain engine performance. (D1.04)
SLO 11A.4.2.6	Describe engine construction; perform removal, installation, disassembly/assembly inspection, and reconditioning. (D1.05)
SLO 11A.4.2.7	Describe and perform procedures to diagnose, service, and repair engine lubrication systems. (D1.06)
SLO 11A.4.2.8	Describe the servicing of the engine oil, filters, and start-up. (D1.07)
SLO 11A.4.2.9	Describe cooling system types, operation, and service. (D1.08)
SLO 11A.4.2.10	Describe starting aids. (D1.09)
SLO 11A.4.2.11	Describe air intake and exhaust system design and operation. (D1.10)

GLO 4.3: Perform maintenance on heavy duty equipment systems.

SLO 11A.4.3.1	Perform maintenance on diesel engines.
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Goal 5: Describe and demonstrate the transferable **cross-curricular** knowledge and skills pertaining to heavy duty equipment technology.

GLO 5.1: Read, interpret, and communicate information relevant to heavy duty equipment technology.

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| SLO 11A.5.1.1 | Acquire and interpret service-related information. (B1.02) |
| SLO 11A.5.1.2 | Read, interpret, and communicate information found on components and equipment. |
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GLO 5.2: Apply knowledge and skills from **mathematics**.

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| SLO 11A.5.2.1 | Demonstrate the mathematics skills required for working with engine fundamentals and service. |
| SLO 11A.5.2.2 | Demonstrate proficiency in the use of fractions, decimals, ratios, and percentages. |
| SLO 11A.5.2.3 | Convert between imperial and metric measurements. |
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GLO 5.3: Apply knowledge and skills from **the sciences**.

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| SLO 11A.5.3.1 | Demonstrate an understanding of the viscosity of liquids. |
| SLO 11A.5.3.2 | Demonstrate an understanding of the use of pressure in diesel engine systems. |
| SLO 11A.5.3.3 | Demonstrate an understanding of the chemicals used in diesel engine systems. |
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GLO 5.4: Apply knowledge and skills from **information and communication technology**.

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| SLO 11A.5.4.1 | Demonstrate the use of service information retrieval systems unique to the service and repair industry (e.g., Mitchell ProDemand, All Data, iATN). |
| SLO 11A.5.4.2 | Demonstrate an awareness of shop management software (e.g., electronic work order software). |
| SLO 11A.5.4.3 | Describe basic Internet components and operations, and use Internet functions. (B1.01) |
| SLO 11A.5.4.4 | Demonstrate an understanding of the use of electronic diagnostic tools. |

Goal 6: Demonstrate an awareness of **sustainability** as it pertains to heavy duty equipment technology.

GLO 6.1: Describe the heavy duty equipment industry's **sustainability practices** and its impact on the environment.

- SLO 11A.6.1.1 Discuss the impact of chemical hazards on the environment.
 - SLO 11A.6.1.2 Demonstrate knowledge of efficient material usage to reduce waste and its impact on the environment.
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GLO 6.2: Describe the impact of the heavy duty equipment industry on **human health and well-being**.

- SLO 11A.6.2.1 Discuss the long-term health hazards related to the servicing and maintenance of diesel engines.
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GLO 6.3: Describe **sustainable business practices** within the heavy duty equipment service and repair industry.

- SLO 11A.6.3.1 Discuss the relationship between the state of the economy and the nature of repairs requested by customers.
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Goal 7: Demonstrate an awareness of the **ethical and legal standards** as they pertain to the heavy duty equipment service and repair industry.

GLO 7.1: Demonstrate an awareness of the **ethical and legal expectations** of heavy duty equipment technicians.

- SLO 11A.7.1.1 Demonstrate an awareness of liability concerns related to heavy duty equipment systems and service.
 - SLO 11A.7.1.2 Demonstrate an awareness of legislation related to heavy duty equipment systems and service.
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Goal 8: Demonstrate **employability skills** related to the heavy duty equipment service and repair industry.

GLO 8.1: Demonstrate fundamental **employability skills**.

- SLO 11A.8.1.1 Demonstrate problem-solving skills.
- SLO 11A.8.1.2 Demonstrate critical thinking skills.
- SLO 11A.8.1.3 Demonstrate regular attendance and punctuality.
- SLO 11A.8.1.4 Demonstrate accountability by taking responsibility for own actions.

SLO 11A.8.1.5	Demonstrate adaptability, initiative, and effort.
SLO 11A.8.1.6	Demonstrate the ability to accept and follow direction and feedback.
SLO 11A.8.1.7	Demonstrate teamwork skills.
SLO 11A.8.1.8	Demonstrate the ability to stay on task and to make effective use of time in class and shop environments.
SLO 11A.8.1.9	Demonstrate the ability to communicate respectfully and effectively with coworkers and customers.

GLO 8.2: Demonstrate an understanding of the **business operation** of a heavy duty equipment service and repair facility.

SLO 11A.8.2.1	Discuss the importance of documentation and service reporting.
SLO 11A.8.2.2	Discuss the use of flat rate guidelines in the heavy duty equipment service and repair industry.

Goal 9: Understand **career opportunities** in heavy duty equipment technology and associated professions.

GLO 9.1: Demonstrate an understanding of **career opportunities** in heavy duty equipment technology and associated professions.

SLO 11A.9.1.1	Describe career and employment opportunities related to heavy duty equipment technology.
SLO 11A.9.1.2	Demonstrate an awareness of specialized occupations in the heavy duty equipment service and repair industry.
SLO 11A.9.1.3	Demonstrate an awareness of career paths related to the heavy duty equipment service and repair industry.

Goal 10: Demonstrate an awareness of the **evolution** of heavy duty equipment technology, including its **technological progression and emerging trends**.

GLO 10.1: Describe the **evolution** of heavy duty equipment service and repair, including its **technological progression and emerging trends**.

SLO 11A.10.1.1	Identify changes to vehicle design and their effect on safety, fuel economy, emissions, and equipment performance.
SLO 11A.10.1.2	Discuss the evolution of heavy duty equipment.
