



8676

WELDING PROCESSES AND
FUELS (11C)

30S/30E/30M

A Heavy Duty Equipment Technician Course

8676: WELDING PROCESSES AND FUELS (11C) 30S/30E/30M

Course Description

A student wanting to develop skills in the heavy duty equipment industry must have knowledge of welding processes and fuels. The student will develop skills in oxyacetylene welding and cutting and metallurgy. The student will also be able to diagnose and repair a variety of fuel-related problems, and demonstrate familiarity with alternate fuels.

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

SLO 11C.1.1.9	Demonstrate safety procedures for HVAC system servicing.
SLO 11C.1.1.10	Describe the importance of using personal protective equipment (PPE). (TSA 16)
SLO 11C.1.1.11	Describe safety procedures when handling wheels, tires, and hubs. (F1.04)
SLO 11C.1.1.12	Maintain a safe and organized work environment.
SLO 11C.1.1.13	Document an understanding of the safe use of heavy duty tools and equipment.
SLO 11C.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 11C.2.1.1	Identify, select, use, and maintain tools, equipment, materials, and consumables used in welding.
SLO 11C.2.1.2	Describe and use basic hand tools, basic shop tools, and fasteners. (D1.01)
SLO 11C.2.1.3	Select and use diagnostic tools, such as infrared temp guns, calipers, and ultrasonic cleaners.
SLO 11C.2.1.4	Demonstrate an understanding of the various fuels used in heavy duty equipment.
SLO 11C.2.1.5	Develop an alternate fuel (e.g., biodiesel, ethanol).

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

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

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

- SLO 11C.3.1.4 Describe manual lifting procedures using correct body mechanics. (A2.04)
 - SLO 11C.3.1.5 Describe lifting equipment construction, grading, sizing, and limits. (A2.05)
 - SLO 11C.3.1.6 Select the correct equipment for rigging typical loads. (A2.06)
 - SLO 11C.3.1.7 Describe wire rope applications. (A2.07)
 - SLO 11C.3.1.8 Describe winch design, and operational and troubleshooting procedures. (A2.08)
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Goal 4: Diagnose and repair problems with heavy duty equipment systems.

GLO 4.1: Diagnose problems with heavy duty equipment systems.

- SLO 11C.4.1.1 Diagnose problems with welds and welding equipment.
 - SLO 11C.4.1.2 Diagnose problems with fuel systems.
 - SLO 11C.4.1.3 Diagnose issues related to the use of inappropriate fuels.
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GLO 4.2: Describe and repair problems with heavy duty equipment.

- SLO 11C.4.2.1 Identify the components of oxyacetylene equipment. (C1.01)
 - SLO 11C.4.2.2 Demonstrate the procedure for setting up oxyacetylene apparatus. (C1.02)
 - SLO 11C.4.2.3 Describe the principles for using welding and cutting equipment. (C1.03)
 - SLO 11C.4.2.4 Describe metallurgy. (C1.04)
 - SLO 11C.4.2.5 Perform welding, brazing, and cutting procedures. (C1.05)
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GLO 4.3: Perform maintenance on heavy duty equipment systems.

- SLO 11C.4.3.1 Perform maintenance on fuel systems.
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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.

- SLO 11C.5.1.1 Acquire and interpret service-related information. (B1.02)

SLO 11C.5.1.2 Read, interpret, and communicate information found on components and equipment.

GLO 5.2: Apply knowledge and skills from **mathematics**.

SLO 11C.5.2.1 Demonstrate the mathematics skills required for working with welding components.

SLO 11C.5.2.2 Demonstrate proficiency in the use of fractions, decimals, ratios, and percentages.

SLO 11C.5.2.3 Convert between imperial and metric measurements.

GLO 5.3: Apply knowledge and skills from **the sciences**.

SLO 11C.5.3.1 Demonstrate an understanding of metallurgy as it applies to welding.

SLO 11C.5.3.2 Demonstrate an understanding of the chemical processes required in the production of alternate fuels (e.g., ethanol, biodiesel).

GLO 5.4: Apply knowledge and skills from **information and communication technology**.

SLO 11C.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 11C.5.4.2 Demonstrate an awareness of shop management software (e.g., electronic work order software).

SLO 11C.5.4.3 Describe basic Internet components and operations, and use Internet functions. (B1.01)

SLO 11C.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 11C.6.1.1 Discuss the effects of fuel spillage on the environment.

SLO 11C.6.1.2 Discuss the effects of fuel emissions on the environment.

SLO 11C.6.1.3 Discuss the effects of alternate fuels on the environment.

GLO 6.2: Describe the impact of the heavy duty equipment industry on **human health and well-being**.

SLO 11C.6.2.1 Discuss the long-term health hazards related to welding.

GLO 6.3: Describe **sustainable business practices** within the heavy duty equipment service and repair industry.

No applicable SLOs.

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 11C.7.1.1 Demonstrate an awareness of liability concerns related to heavy duty equipment systems and service.

SLO 11C.7.1.2 Demonstrate an awareness of legislation related to heavy duty equipment systems and service.

Goal 8: Demonstrate **employability skills** related to the heavy duty equipment service and repair industry.

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

SLO 11C.8.1.1 Demonstrate problem-solving skills.

SLO 11C.8.1.2 Demonstrate critical thinking skills.

SLO 11C.8.1.3 Demonstrate regular attendance and punctuality.

SLO 11C.8.1.4 Demonstrate accountability by taking responsibility for own actions.

SLO 11C.8.1.5 Demonstrate adaptability, initiative, and effort.

SLO 11C.8.1.6 Demonstrate the ability to accept and follow direction and feedback.

SLO 11C.8.1.7 Demonstrate teamwork skills.

SLO 11C.8.1.8 Demonstrate the ability to stay on task and to make effective use of time in class and shop environments.

SLO 11C.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 11C.8.2.1 Discuss the importance of documentation and service reporting.

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 11C.9.1.1 Describe career and employment opportunities related to heavy duty equipment technology.
- SLO 11C.9.1.2 Demonstrate an awareness of specialized occupations in the heavy duty equipment service and repair industry.
- SLO 11C.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 11C.10.1.1 Identify changes to vehicle design and their effect on safety, fuel economy, emissions, and equipment performance.
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