



9031

AUTOMOTIVE METALS AND
WELDING (11B)

30S/30E/30M

A Collision Repair and Refinishing Technology Course

9031: AUTOMOTIVE METALS AND WELDING (11B) 30S/30E/30M

Course Description

In this course, students will learn about metallurgy, focusing on the types of metals used in vehicle construction. Students will develop welding skills while operating and maintaining different types of welding equipment, such as metal inert gas (MIG), oxyacetylene, plasma arc, and resistance spot welding equipment.

Goal 1: Describe and apply appropriate **health and safety** practices.

GLO 1.1: Describe and apply appropriate **health and safety** practices.

- SLO 11B.1.1.1: Identify safety and health requirements. (A2.1)
- SLO 11B.1.1.2: Identify personal protective equipment (PPE) and procedures and describe the importance of using them. (A2.2) (TSA 16)
- SLO 11B.1.1.3: Identify electrical safety and outline the safety principles for working on and around electrical equipment. (A2.3) (TSA 18)
- SLO 11B.1.1.4: Identify fire safety practices and outline workplace fire safety principles. (A2.4) (TSA 19)
- SLO 11B.1.1.5: Recognize and control hazards. (A2.6)
- SLO 11B.1.1.6: Identify the hazards in confined spaces and the preparation needed to work in a confined space. (A2.7) (TSA 20)
- SLO 11B.1.1.7: Identify First Aid/CPR. (A2.8)
- SLO 11B.1.1.8: Explain the Workplace Hazardous Material Information System (WHMIS) and identify the WHMIS safety requirements. (A2.9) (TSA 13)
- SLO 11B.1.1.9: Identify and control hazards. (A2.10)
- SLO 11B.1.1.10: Identify safety precautions related to gas metal arc welding. (C2.2)
- SLO 11B.1.1.11: Identify and describe safety considerations and procedures related to fasteners and adhesives. (D2.1)
- SLO 11B.1.1.12: Practise safety precautions related to batteries. (B2.8)
- SLO 11B.1.1.13: Identify safety considerations when working with body fillers and abrasives. (F2.4)

- SLO 11B.1.1.14: Create and maintain a safe and organized working environment.
- SLO 11B.1.1.15: Follow guidelines listed in the Safe Work Procedure for specific tasks.
- SLO 11B.1.1.16: Describe and demonstrate safety considerations when using cutting and heating equipment. (C1.1)
- SLO 11B.1.1.17: Identify safety precautions related to gas metal arc welding. (C2.2)
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GLO 1.2: Demonstrate knowledge of the *Trade Safety Awareness Manual*.

No applicable SLOs.

Goal 2: Select, use, and manage **tools and equipment**.

GLO 2.1: Select and manage **tools and equipment**.

- SLO 11B.2.1.1: Identify, describe, and demonstrate care and maintenance procedures related to tools and equipment. (A4.10, A4.17).
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GLO 2.2: Use **tools and equipment**.

- SLO 11B.2.2.1: Identify types of electric welding and gas cutting equipment, and describe their applications. (A4.7)
- SLO 11B.2.2.2: Identify and demonstrate types of straightening equipment, and describe their applications. (A4.8, A4.16)
- SLO 11B.2.2.3: Identify and describe gas metal arc welding equipment and accessories. (C2.3)
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Goal 3: Demonstrate vehicle **damage analysis** and **repair estimation**.

GLO 3.1: Demonstrate vehicle **damage analysis**.

- SLO 11B.3.1.1: Identify sheet metal distortion.
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GLO 3.2: Demonstrate vehicle **repair estimation**.

No applicable SLOs.

Goal 4: Demonstrate **welding** procedures.**GLO 4.1:** Demonstrate **welding** procedures.

- SLO 11B.4.1.1: Prepare surfaces for welding.
 - SLO 11B.4.1.2: Demonstrate cutting and heating processes, and describe their application. (C1.2)
 - SLO 11B.4.1.3: Identify and describe equipment, components, and accessories used in cutting and heating processes. (C1.3)
 - SLO 11B.4.1.4: Demonstrate the procedures to set up, maintain, and shut down oxyacetylene equipment. (C1.4)
 - SLO 11B.4.1.5: Demonstrate the procedures to set up, maintain, and shut down plasma arc cutting equipment. (C1.5)
 - SLO 11B.4.1.6: Demonstrate the procedures used to cut with oxyacetylene equipment. (C1.6)
 - SLO 11B.4.1.7: Demonstrate the procedures used to cut with plasma arc cutting equipment. (C1.7)
 - SLO 11B.4.1.8: Demonstrate the procedures used to heat with oxyacetylene equipment. (C1.8)
 - SLO 11B.4.1.9: Set up and shut down oxyacetylene equipment. (C1.9)
 - SLO 11B.4.1.10: Perform heating and cutting procedures with plasma arc equipment. (C1.10)
 - SLO 11B.4.1.11: Define and describe GMAW (gas metal arc welding), related terminology, and its applications. (C2.1)
 - SLO 11B.4.1.12: Identify the types of welds performed using GMAW equipment. (C2.4)
 - SLO 11B.4.1.13: Demonstrate the procedures used to gas metal arc weld various substrates. (C2.5)
 - SLO 11B.4.1.14: Identify weld defects, their causes, and the procedures to prevent and correct them. (C2.6)
 - SLO 11B.4.1.15: Operate, troubleshoot, and maintain GMAW equipment. (C2.7)
 - SLO 11B.4.1.16: Describe and perform various types of welds (lap, butt, flat, plug, recessed, tack, stitch, and continuous) in various positions (overhead, horizontal, and vertical). (C2.8)
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Goal 5: Demonstrate structural repair.**GLO 5.1: Demonstrate an understanding of vehicle construction.**

- SLO 11B.5.1.1: Identify types of vehicle construction, and describe their characteristics. (D1.1)
 - SLO 11B.5.1.2: Identify body sections, and describe their components. (D1.2)
 - SLO 11B.5.1.3: Identify and describe structural and non-structural components. (D1.3)
 - SLO 11B.5.1.4: Identify and describe the types of materials used in vehicle construction. (D1.4)
 - SLO 11B.5.1.5: Demonstrate sheet metal panel adjustments. (D1.5)
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GLO 5.2: Demonstrate measuring and gauging.

No applicable SLOs.

GLO 5.3: Perform structural repairs.

- SLO 11B.5.3.1: Perform fit-up on replacement sheet metal components.
 - SLO 11B.5.3.1: Describe the procedures and techniques used to protect electrical and electronic systems and components during repair. (Level 3, F5.9)
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Goal 6: Demonstrate sheet metal repair.**GLO 6.1: Demonstrate an understanding of the properties of metal.**

- SLO 11B.6.1.1: Identify the types of automotive sheet metal. (F1.1)
 - SLO 11B.6.1.2: Define and explain terms associated with metallurgy. (B2.1)
 - SLO 11B.6.1.3: Describe metal properties. (B1.1, B2.3)
 - SLO 11B.6.1.4: Describe heat and its effect on metals. (B1.2)
 - SLO 11B.6.1.5: Describe high strength steel (HSS) and its applications. (B1.3)
 - SLO 11B.6.1.6: Describe the effects metal working has on metallurgic properties. (B2.5)
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GLO 6.2: Repair sheet metal.

- SLO 11B.6.2.1: Identify and describe types of damage to sheet metal. (F1.2)
- SLO 11B.6.2.2: Identify the types of panels and their associated repair procedures. (F1.4)
- SLO 11B.6.2.3: Describe the methods used to detect surface irregularities. (F1.6)
- SLO 11B.6.2.4: Describe the procedures used to rough out and align damaged sheet metal. (F1.7)
- SLO 11B.6.2.5: Describe the procedures used to prepare sheet metal for application of fillers. (F1.8)
- SLO 11B.6.2.6: Describe the procedure for correcting rust perforation. (F1.9)
- SLO 11B.6.2.7: Determine primary and secondary damage. (F1.11)
- SLO 11B.6.2.8: Perform fabrication for rust repair patches. (F1.12)
- SLO 11B.6.2.9: Describe the procedures to prevent or correct problems that occur when working metals. (B2.6)

Goal 7: Select, use, and manage seam sealers, fillers, and adhesives.

GLO 7.1: Select, use, and manage seam sealers and adhesives.

No applicable SLOs.

GLO 7.2: Select, use, and manage fillers.

No applicable SLOs.

Goal 8: Select, use, and manage fasteners.

GLO 8.1: Select, use, and manage fasteners.

No applicable SLOs.

Goal 9: Demonstrate glass repair and replacement.

GLO 9.1: Demonstrate glass repair and replacement.

No applicable SLOs.

Goal 10: Demonstrate repair and replacement of **upholstery, trim, and hardware.**

GLO 10.1: Repair and replace **upholstery.**

No applicable SLOs.

GLO 10.2: Repair and replace **trim and hardware.**

No applicable SLOs.

Goal 11: Demonstrate **surface preparation.**

GLO 11.1: Select, use, and manage **materials other than abrasives** used in surface preparation.

SLO 11B.11.1.1: Identify products used to clean surfaces, their applications, and the procedures for use. (H1.2)

SLO 11B.11.1.2: Identify substrate types, and describe the procedures and considerations for evaluating their condition. (H1.3)

SLO 11B.11.1.3: Describe and demonstrate surface preparation of substrates. (H1.6)

SLO 11B.11.1.4: Describe and demonstrate masking and unmasking techniques. (H1.7).

GLO 11.2: Select, use, and manage **abrasives** used in surface preparation.

SLO 11B.11.2.1: Identify the types of abrasives, and describe their characteristics and applications. (F2.1)

SLO 11B.11.2.2: Describe the procedures and techniques for using abrasives. (F2.2)

GLO 11.3: Prepare substrates.

SLO 11B.11.3.1: Describe ideal working conditions for surface preparation. (H1.1)

SLO 11B.11.3.2: Identify and describe the methods involved in stripping topcoats, undercoats, and paint. (H1.5)

Goal 12: Demonstrate **refinishing.**

GLO 12.1: Demonstrate **refinishing** processes.

SLO 11B.12.1.1: Demonstrate the ability to apply primers. (H1.8)

SLO 11B.12.1.2: Demonstrate the ability to use proper spray gun technique and to maintain equipment. (H1.9)

Goal 13: Demonstrate **cleaning and detailing**.

GLO 13.1: Demonstrate **cleaning and detailing**.

SLO 11B.13.1.1: Clean vehicles in order to prepare them for welding

Goal 14: Describe **vehicle systems**.

GLO 14.1: Describe **vehicle systems**.

SLO 11B.14.1.1: Identify types of batteries, and describe their purpose, location, construction, operation, and ratings. (B2.7)

Goal 15: Describe and demonstrate transferable **cross-curricular** knowledge and skills.

GLO 15.1: Read, interpret, and communicate information.

SLO 11B.15.1.1: Read, interpret, and communicate terminology and acronyms related to metals and welding.

GLO 15.2: Apply knowledge and skills from **mathematics**.

SLO 11B.15.2.1: Demonstrate trade-related calculations as specified by instructor. (B2.4)

GLO 15.3: Apply knowledge and skills from **information and communication technology**.

No applicable SLOs.

GLO 15.4: Apply knowledge and skills from the **sciences**.

No applicable SLOs.

Goal 16: Understand **career opportunities** and the **working environment**.

GLO 16.1: Describe **education, career opportunities, professional organizations, and working environments** related to collision repair and refinishing technology and associated fields.

SLO 11B.16.1.1: Describe apprenticeship, education, career opportunities, and professional organizations related to welding and metal fabrication.

SLO 11B.16.1.2: Describe working environments related to welding and metal fabrication.

Goal 17: Demonstrate an awareness of **sustainability**.

GLO 17.1: Describe the effects of collision repair and refinishing technology on **human health and well-being**, including on tradespersons working in the field and those who use their services.

SLO 11B.17.1.1: Demonstrate the use of dust collection systems.

SLO 11B.17.1.2: Discuss long-term health concerns related to welding.

SLO 11B.17.1.3: Discuss the importance of dust collection systems.

GLO 17.2: Describe collision repair and refinishing technology's **sustainability practices** and **impact on the environment**.

SLO 11B.17.2.1: Follow environmentally appropriate procedures in the disposing and recycling of metals.

Goal 18: Demonstrate an awareness of **ethical and legal standards** as they pertain to collision repair and refinishing technology.

GLO 18.1: Practise **ethical and legal standards** as they pertain to collision repair and refinishing technology.

SLO 11B.18.1.1: Discuss procedures to follow when restricted products are found in a vehicle.

Goal 19: Demonstrate **employability skills**.

GLO 19.1: Demonstrate fundamental **employability skills**.

SLO 11B.19.1.1: Demonstrate regular and punctual attendance.

SLO 11B.19.1.2: Demonstrate the ability to communicate respectfully and effectively with teachers, supervisors, co-workers, and students.

SLO 11B.19.1.3: Demonstrate accountability by taking responsibility for own actions.

SLO 11B.19.1.4: Demonstrate adaptability, initiative, and effort.

SLO 11B.19.1.5: Demonstrate teamwork skills.

SLO 11B.19.1.6: Demonstrate the ability to stay on task and effectively use time in class and work environments.

SLO 11B.19.1.7: Demonstrate the responsible use of wireless communication devices.

GLO 19.2: Demonstrate an awareness of **cultural proficiency** and its importance in the workplace.

SLO 11B.19.2.1: Discuss the diversity of cultures in society.

GLO 19.3: Demonstrate an understanding of the **business operation** of a collision repair and refinishing technology facility.

SLO 11B.19.3.1: Describe procedures for organizing/storing parts and materials. (A5.6)

GLO 19.4: Demonstrate **critical thinking skills** in planning, procedures, analysis, and diagnosis.

SLO 11B.19.4.1: Discuss the need for critical thinking.

SLO 11B.19.4.2: Discuss the need for problem-solving skills.

Goal 20: Demonstrate an understanding of the **evolution** of collision repair and refinishing technology, including its **technological progression and emerging trends**.

GLO 20.1: Describe the **evolution** of collision repair and refinishing technology, including its **technological progression and emerging trends**.

SLO 11B.20.1.1: Discuss the evolution of automotive metals and welding, including technological progressions and emerging trends.
