

Grade 12A Advanced GMAW (MIG) Procedures (40S)

Course Code: 8487

Credit: 1.0 Credit

Program: Senior Years Technology Education Program (SYTEP)

School: Swan Valley Regional Secondary School

Program Cluster: Welding Technology

Course Length: Approximately 110 instructional hours (one semester)

Instructor: Mr. Jeremy Hicks

Course Description

Advanced GMAW (MIG) Procedures (40S) builds on foundational semi-automatic wire feed welding skills through more complex setup, positional welding, multi-pass work, troubleshooting, and quality inspection.

Students refine parameter selection and technique while completing vertical and overhead fillet welds, groove-weld activities, and advanced joint assemblies. GMAW remains the primary process, with FCAW and MCAW terminology, equipment, consumables, and applications introduced where appropriate and demonstrated when equipment permits.

Instruction reflects the updated Manitoba curriculum and Apprenticeship Manitoba Level 1 outcomes for weld processes, inspection, and semi-automatic wire feed welding.

Course Goals

Upon successful completion of this course, students will:

- Consistently apply advanced safety practices for semi-automatic welding and related fabrication work.
- Explain GMAW, FCAW, and MCAW equipment, consumables, shielding, applications, and limitations.
- Select and fine-tune welding parameters for material thickness, joint type, position, and transfer mode.
- Prepare, fit, tack, and assemble joints using appropriate gaps, alignment, sequencing, and distortion control.
- Produce sound vertical and overhead fillet welds using appropriate techniques.
- Complete multi-pass and groove-weld procedures to assigned criteria.
- Diagnose equipment, feeding, shielding, and weld-quality problems and make effective corrections.

- Inspect, document, repair, and evaluate welds using workplace terminology and quality criteria.

Course Content

Advanced Safety and Equipment Inspection (6 Hours)

Students review semi-automatic welding hazards, compressed-gas safety, ventilation, electrical safety, hot work, working position, equipment condition, and safe troubleshooting. Consistent independent safety performance is expected.

Semi-Automatic Processes and Consumables (10 Hours)

Students compare GMAW, FCAW, and MCAW terminology, power sources, guns, feeders, shielding methods, solid and tubular electrodes, classifications, applications, advantages, and limitations.

Parameter Selection and Metal Transfer (10 Hours)

Students relate voltage, wire-feed speed, amperage, polarity, electrode extension, shielding-gas flow, inductance where available, and travel speed to transfer mode, penetration, bead shape, and weld quality.

Joint Preparation, Fit-Up and Distortion Control (10 Hours)

Students prepare edges, establish gaps and alignment, use clamps and fixtures, tack joints, select weld sequences, and control distortion in more complex assemblies.

Vertical-Position Fillet Welds (18 Hours)

Students produce vertical-up fillet welds using suitable settings, work and travel angles, electrode manipulation, bead placement, interpass cleaning, and heat control.

Overhead-Position Fillet Welds (16 Hours)

Students produce overhead fillet welds while controlling puddle size, travel speed, electrode angles, tie-in, bead profile, spatter, and safe body position.

Groove Welds and Multi-Pass Procedures (16 Hours)

Students prepare and complete assigned groove welds and multi-pass joints, maintaining fusion, alignment, interpass cleaning, bead sequence, and dimensional requirements.

FCAW Applications (8 Hours)

Students identify self-shielded and gas-shielded FCAW equipment and consumables and compare their applications with GMAW. Practical demonstrations or introductory welds are completed when suitable equipment and consumables are available.

Quality Inspection, Repair and Advanced Assessment (16 Hours)

Students inspect welds using visual criteria and measuring devices, identify discontinuities and surface imperfections, determine causes, make parameter or technique corrections, complete approved repairs, and demonstrate advanced proficiency through practical testing or fabrication work.

Assessment

Student achievement will be evaluated using the following categories:

- **Classwork:** 20%
- **Practical Skill Demonstrations:** 30%
- **Tests and Quizzes:** 30%
- **Projects:** 20%

Assessment emphasizes both theoretical knowledge and practical skill development. Students are expected to demonstrate safe work habits, active participation, improving technical skill, and quality workmanship throughout the course.

Required Personal Protective Equipment

Students are required to wear appropriate PPE during all shop activities. If a student does not have the following PPE, it will be provided to them.

- CSA-approved steel-toe boots or toe caps
- Safety glasses
- Hearing protection
- Welding gloves
- Appropriate protective clothing and welding helmet as required

Students who do not wear the required PPE may not be permitted to participate in shop activities.

Student Expectations

Students are expected to:

- Attend class regularly and arrive on time.
- Follow all shop safety rules, safe work procedures, and teacher instructions.
- Wear required PPE before entering the shop.
- Respect classmates, instructors, equipment, materials, and facilities.
- Maintain a clean and organized work area.
- Participate fully in classroom and shop activities.
- Demonstrate responsibility, teamwork, communication, and professionalism.
- Complete assignments, weld samples, tests, and projects to the best of their ability.

Unsafe behavior may result in removal from shop activities until safety expectations have been met.

Cell Phone Policy

To maintain a safe and focused learning environment, students are required to place their cell phones in the classroom phone lockbox at the beginning of each class. Phones will remain securely stored for the duration of the class and will be returned at the end of the class period.

Students do not require personal cell phones during Welding Technology. School-issued laptops and classroom resources will be provided for online learning, research, quizzes, drawings, documentation, or other educational tasks.

This policy minimizes distractions, promotes engagement, and supports a safe working environment in the welding shop.

Curriculum Alignment

This course addresses learning outcomes from the updated Manitoba Grade 12A Advanced GMAW (MIG) Procedures curriculum and is aligned with selected Apprenticeship Manitoba Level 1 technical-training outcomes.

Primary Apprenticeship Manitoba units addressed include:

- A8 Weld Process and Quality Inspection I
- A12 Semi-Automatic Wire Feed Welding I

Supporting outcomes related to trade safety, career education, trade communication, trade mathematics, tools and equipment, materials and consumables, and workplace professionalism are integrated throughout the course.