

Grade 12C Advanced Metal Design Fabrication (40S)

Course Code: 8489

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 Metal Design Fabrication (40S) develops the planning, drawing interpretation, layout, material handling, assembly, and project-management skills required for complex welding fabrication.

Students move from an approved design or drawing package to a completed product by preparing estimates and cut lists, selecting materials and processes, creating layouts, cutting and fitting components, using jigs and fixtures, controlling distortion, welding assemblies, and completing final inspection and finishing.

Instruction reflects the updated Manitoba curriculum and Apprenticeship Manitoba Level 1 outcomes for material handling, drawings and welding symbols, inspection, layout, and fabrication.

Course Goals

Upon successful completion of this course, students will:

- Plan and manage fabrication work using safe, efficient, and professional shop practices.
- Interpret and produce working drawings, dimensions, tolerances, weld symbols, and bills of materials.
- Apply trade mathematics to material estimates, angles, geometry, allowances, and project costing.
- Select, handle, store, and prepare materials using suitable tools and equipment.
- Create accurate layouts, templates, cut lists, and assembly plans.
- Use thermal and mechanical cutting, edge preparation, fitting, and tack-welding procedures.

- Use jigs, fixtures, sequencing, alignment checks, and distortion-control methods during assembly.
- Complete and inspect an advanced fabrication project to dimensional and workmanship criteria.

Course Content

Project Safety, Planning and Shop Management (6 Hours)

Students complete hazard assessments, review safe work procedures, plan workflow, select PPE, identify material-handling needs, organize work areas, and manage time, tools, consumables, and housekeeping throughout the project.

Drawings, Welding Symbols and Specifications (14 Hours)

Students interpret and produce working drawings, orthographic and pictorial views, dimensions, tolerances, sections, details, welding symbols, notes, bills of materials, and revision information.

Trade Mathematics, Estimating and Cut Lists (10 Hours)

Students calculate lengths, angles, areas, volumes, diagonal measurements, material allowances, quantities, waste, and basic project costs using metric and imperial systems.

Material Handling and Equipment (6 Hours)

Students select and inspect slings, lifting devices, carts, clamps, and other handling equipment; assess loads and balance; communicate during moves; and store materials safely within school-shop limitations.

Advanced Layout and Templates (12 Hours)

Students transfer dimensions from drawings, establish datums and reference lines, lay out angles and shapes, use triangulation and diagonal checks, create templates, and verify accuracy before cutting.

Cutting, Gouging and Edge Preparation (12 Hours)

Students select and use mechanical and thermal processes to cut, bevel, cope, notch, drill, grind, and clean components. Cut quality, allowances, joint preparation, and efficient material use are emphasized.

Fit-Up, Jigs, Fixtures and Distortion Control (12 Hours)

Students use clamps, strongbacks, wedges, jigs, fixtures, and alignment tools; establish gaps and tolerances; tack assemblies; select welding sequences; and monitor movement and distortion.

Advanced Fabrication Project (28 Hours)

Students independently or collaboratively construct an approved project from drawings. They document planning, prepare components, assemble and weld the project, solve fabrication problems, manage changes, and demonstrate quality workmanship.

Quality Inspection, Finishing and Presentation (10 Hours)

Students verify dimensions and tolerances, visually inspect welds and surfaces, correct deficiencies, remove sharp edges, apply an appropriate finish, complete project documentation, and evaluate or present the finished 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 12C Advanced Metal Design Fabrication curriculum and is aligned with selected Apprenticeship Manitoba Level 1 technical-training outcomes.

Primary Apprenticeship Manitoba units addressed include:

- A6 Material Handling and Access Equipment
- A7 Drawings and Welding Symbols
- A8 Weld Process and Quality Inspection I
- A10 Layout and Fabrication 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.