

WELDER / METAL FABRICATOR

PROGRAM OBJECTIVES

The Welder/Metal Fabricator Program at Eastern College, is designed to provide students with the high quality training necessary to start their career in the Welder/Metal Fabricator trade. Students will have the opportunity to combine classroom learning with the application of the skills in a shop setting.

The objective of this program is to prepare students with the skills necessary to gain employment in their trade. Instruction provided by industry experts ensures a balance between classroom theory and shop application. This means you will read and study how to do a job and then actually apply the skills in a shop setting.

Students will develop skills in hand and power tools, operation of large equipment such as shear and ironworker, metallurgy, oxy-acetylene brazing and cutting, SMAW, arc cutting and gouging, GMAW, FCAW and blueprint reading.

Students will complete an industry work term of four weeks as part of their program and will be evaluated by the journey person/mentor during the work term.

CAREER OPPORTUNITIES

Graduates of the Welder/Metal Fabricator program are entering the field at a time when industry demand is high and Atlantic Canada, and all of Canada, is experiencing strong growth. Graduates have opportunities in metal shops, assembly plants and manufacturing, refineries and commercial and industrial sectors.

Following graduation from the program those graduates who go on to complete apprenticeship and obtain a Certificate of Qualification with Red Seal will have opportunities for project supervision, research and development and even self-employment.

PREREQUISITES

- High School Diploma or
- Mature student status or
- Adult High School Diploma or
- High School equivalency (GED)

GRADUATION REQUIREMENTS

A student must obtain an overall grade, in each module of at least 70% in order to graduate and receive a diploma. A student must complete all requirements of Student Success Strategies as well as the field placement requirements.

APPRENTICESHIP AND OCCUPATIONAL CERTIFICATION

Welder/Metal Fabricator is an apprenticeship trade in New Brunswick and graduates working in the trade with a journey-person should apply to become registered apprentices as soon as they start work.

Graduates of this program may qualify for credit toward their apprenticeship upon registering as an apprentice with their trade employer and Apprenticeship and Occupational Certification, Government of NB. Graduates may also be eligible to challenge the apprenticeship level one exam and upon successful completion of that exam and meeting the on the job requirements for their trade will become second year apprentices.

Please visit the Federal Government web-site at: www.servicecanada.gc.ca/en/gov/apprenticeship.htm for information on how to receive a government of Canada Apprentice Incentive Grant (AIG) of \$1000.00 for completion of level one of apprenticeship (includes both exam and on the job requirements), and for information on how to receive another \$1000.00 grant for completion of level two of apprenticeship.

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PROGRAM MODULES

Student Success Strategies* Career Planning and Preparation I* Career Planning and Preparation II for Trades Software Lab: Computer Fundamentals* Welder/metal fabricator Apprenticeship Orientation Safety Guidelines Metal Fabricator/Welding Safety Power Tools Hand Tools Oxyfuel Equipment Oxyfuel Welding, Brazing and Braze Welding Oxyfuel Cutting Materials Handling / Rigging SMAW Equipment Mild Steel Electrodes Basic Joints and Weld Types Shop / Lab Practices: SMAW Welds on Mild Steel Plate Arc Cutting and Gouging Gas Metal Arc Welding (GMAW) Equipment GMAW Filler Metals, Shielding Gases and Safety GMAW Equipment Maintenance and Troubleshooting Weld Faults Flux Cored Arc Welding (FCAW)	Submerged Arc Welding (SAW) Blueprint Reading 1 Blueprint Reading 2 – Symbols Shop / Lab Practices: GMAW Welds on Mild Steel Shop / Lab Practices: FCAW Welds on Mild Steel Shop / Lab Practices: Combined GMAW and FCAW Welds on Mild Steel Mathematics Fractions Decimals Percentages and Ratios Geometric Formulas Metric and Imperial Measurement Production and Properties of Metal Distortion Heat Treatment Work Placement
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Theory	464 hours
Practical	576 hours
Work Term	160 hours
Total Hours	1200 hours
Total Weeks	32 weeks

*4 hours/day, all other classes are full days.

MODULE DESCRIPTIONS

Student Success Strategies

In this orientation module, emphasis is placed on thinking about achieving success from Day One. This module stresses the importance of developing non-technical skills to enhance personal, academic, and career success. This includes understanding learning styles and honing practical study skills, such as memory, reading, writing, note-and test-taking techniques. Personal exercises will focus on teamwork, decision making and problem solving skills, setting SMART goals and maintaining a positive attitude; techniques for managing change, money, stress and conflict will also be explored.

Career Planning and Preparation Level I

This module introduces tools for planning and preparing for a successful job search, so that students can maintain a career-focused approach throughout their education program. Students will learn about the "Hidden" Job Market and ways to access it in their upcoming job search, how to research opportunities and network for industry contacts, and use appropriate etiquette when communicating with prospective employers. Students will identify their personal skills, values and preferences for the workplace, begin preparation of a professional resume and references, and organize proof documents for their career portfolio. Class discussions on various self-management topics introduced

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in Student Success Strategies will round out this module, which is a pre-requisite for Career Planning and Preparation - Level II.

Career Planning and Preparation Level II for Trades

This module continues to build on the concepts and skills introduced in Career Planning and Preparation - Level I. Students will identify and practice the different types and forms of interviews, practice responding to typical questions, and practice follow-up, evaluation and negotiation techniques they can use to ensure success. Students also practice the customer service and interpersonal skills necessary for success in today's business environment, with focus on oral and written techniques that ensure effective business communication.

Software Lab: Computer Fundamentals

Through a combination of theory and hands-on-practice, this module examines the role and use of the computer in today's workplace. Emphasis is placed on those computers outfitted with the Microsoft Windows operating system. Students will review basic computer concepts, Windows OS usage, and complete hands-on training exercises in business-standard software applications, including Microsoft Outlook and Microsoft Word. Keyboarding skills are also honed via daily keyboarding exercises and drills.

Welder/metal fabricator Apprenticeship Orientation Safety Guidelines

This module teaches you how to locate and interpret sections of the *Workers' Compensation Act*, the *Occupational Health and Safety Act* and the *Workplace Hazardous Materials Information System (WHMIS)*. This module also contains procedures to follow when you have to weld or cut in a confined space that has the potential to become a dangerous environment.

Metal Fabricator/Welding Safety

The purpose of this module is to alert you to some of the hazards found around steel fabrication, welding and cutting operations. This module teaches you what personal protective equipment and clothing is necessary when you are welding, cutting and working with hazardous and toxic materials. Because arc welding involves the use of electricity, this module also deals with the effects of electricity and the safety precautions to be followed in order to prevent injury to you and to others.

Power Tools

This module describes the operating characteristics, physical hazards and safe operating guidelines and procedures for:

- grinders, both portable and stationary
- drills and drill presses
- forming tools including rolls, benders and brakes
- cutting tools including shears, punches and saws

Hand Tools

Hand tools used in the steel fabrication/welding trade range from measuring and layout tools used in preparation work to tools used for fit-up and fabrication work. This module provides information on the selection, proper use and care of the more common hand tools used in the steel fabrication/welding trades.

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Oxyfuel Equipment

In order for you to assemble and safely use oxyfuel equipment, you need information on the topics included within this module such as: gases used; equipment components; set-up procedures; using the equipment; shut down procedures and flame types and their uses. This module will enable you to:

- Describe the characteristics and handling procedures for oxygen and fuel gases. Describe the functions of oxyfuel equipment components
- Demonstrate the use, care and maintenance of oxyfuel equipment components
- Explain the recommended procedures for placement, set-up and shutdown of oxyfuel equipment
- Identify causes and preventative measures for backfires, flashbacks and burnbacks
- Describe pressure and flame adjustments

Oxyfuel Welding, Brazing and Braze Welding

The theory sections and practical exercises contained within this module are designed to help you acquire the skills you need to competently execute acceptable quality oxyfuel fusion welds, braze welds and brazing operations.

Oxyfuel Cutting

Oxyfuel cutting is a process commonly used to cut steel to size and shape and to prepare joint edges for welding. This module will enable you to safely perform oxyfuel cutting operations.

Materials Handling/Rigging

This module shows you how to identify safe procedures for handling and storing materials. To this end, the module contains sections on:

- Weight and center of gravity of loads
- Using slings for lifting and the effect of sling angles
- Load limits of commonly used wire rope and synthetic material slings
- Causes and effects of shock loading on rigging
- Occupational Health and Safety regulations on safety factors
- Hand signals for crane operations
- Safe procedures for lifting, hoisting or moving loads
- Knots, hitches and bends
- Proper care and use of wire rope, synthetic rope and chains
- Correct use of plate clamps
- Correct use of procedure for the application of cable clips

SMAW Equipment

This module is designed to introduce you to some of the SMAW related terms as they apply to electricity and welding machines.

This module will enable you to:

- Identify SMAW equipment
- Define SMAW related terms
- Describe AC and AC-DC rectified welding power sources
- Describe AC and AC-DC generator welding power sources
- Describe multi-process inverter welding power sources
- Identify welding cables and accessories for welding power sources
- Identify the effect of arc length on amperage and voltage

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Mild Steel Electrodes

This module is designed to help you understand the terminology associated with the mechanical properties of carbon steel electrodes. The module also contains information about the American Welding Society and Canadian Standards Association carbon steel electrode specifications and classification systems. The module concludes by explaining recommended practices for the handling, storage and selection of appropriate mild steel electrodes for various welding projects.

Basic Joints and Weld Types

This module describes basic joint and weld types with particular reference to joint and weld type variations, terminology, dimensioning, advantages and limitations. The module then offers guidelines for making an informed decision on the selection of a joint and weld type for a given job.

Shop/Lab Practices: SMAW Welds on Mild Steel Plate

This module is designed to increase your knowledge of SMAW and to develop your hand skills with this process. The module presents procedures that are applicable to perform surfacing, fillet and groove welds on mild steel using the (SMAW) process. The procedures prescribed in the module have historically proven successful in the production of sound welds. The techniques that you develop can be applied to many other processes and material types. Recommended progression is to perform, in order, the following projects for the development of your skills to an acceptable level of competency:

- Surfacing beads in the flat position
- Fillet weld in the flat (1F) position
- Fillet weld in the horizontal (2F) position
- Fillet weld in the vertical (3F) position
- Groove weld in the flat (1G) position
- Groove weld in the flat (1G) position using a 1GF Test Assembly

Arc Cutting and Gouging

As you become more involved with your trade, you will be required to use arc-cutting processes for the preparation and repair of a wide variety of metals in various fabrications. This module describes the *carbon arc cutting* with air process (CAC-A) along with the *plasma arc cutting* process (PAC). In-shop practical exercises and demonstrations are provided so you can work with, or directly observe the CAC-A and PAC processes. A brief description of other arc cutting processes is also included.

Gas Metal Arc Welding (GMAW) Equipment

GMAW has been developed primarily for increasing production efficiency and quality in welding on a variety of construction materials. The equipment associated with GMAW is discussed in detail in this module, including sections on:

- Principles of operation
- Components of a GMAW set-up
- Modes of metal transfer
- Power sources
- Wire drive systems
- Gun and cable assemblies
- Shielding gas supply systems

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GMAW Filler Metals, Shielding Gases and Safety

This module is designed to give you the knowledge you need to select GMAW filler metals and shielding gases to suit job requirements. A section on equipment and how to avoid the creation of weld defects. A section on GMAW advantages and disadvantages is included to help you decide where GMAW is best applied on the job. The last section deals with the precautions that you must take in order to work safely with GMAW.

GMAW Equipment Maintenance and Troubleshooting

This module describes the set-up, troubleshooting and maintenance of GMAW equipment. The module contains directions on how to make adjustments to correct and prevent problems arising during production welding, and how to follow simple, but effective ongoing maintenance procedures.

Weld Faults

You must always strive to achieve a high standard of quality in your work. This applies not only to your welding, but also to the selection and preparation of materials and to finishing work as well, such as removal of welding spurs and spatter. Weld faults occur whenever this standard is not met. This module will enable you to identify weld faults, know their causes and determine how to avoid and correct the weld faults.

Flux Cored Arc Welding (FCAW)

This module describes the FCAW process including the equipment requirements, shielding gases and filler metals. A section on FCAW equipment maintenance and troubleshooting is included.

Submerged Arc Welding (SAW)

This module describes the SAW process through the identification and description of its equipment and consumables. Sections on operating variables and equipment maintenance and troubleshooting are included. A final section deals with the advantages and limitations of SAW.

Blueprint Reading 1

You must read blueprints in order to be able to build a project in the way it was designed. This module will enable you to describe and interpret the paper language used in producing a set of working drawings.

Blueprint Reading 2 – Symbols

Welding symbols provide an efficient means of placing complete information on shop drawings. It is critically important that the welds are completed as required so the finished weldment performs to specified standards. This module provides information and exercises to enable you to correctly understand and interpret symbols and non-destructive examination symbols.

Shop/Lab Practices: GMAW Welds on Mild Steel

This module is designed to help you develop your hand skills in performing surface welds, fillet welds and groove welds on mild steel using the GMAW process. The illustrated procedures in the module have proven successful in the production of sound welds. The techniques that you develop with GMAW can be applied to many other processes and material types. The recommended progression is to perform the following projects in the orders shown, to an acceptable level of competency:

- Surfacing beads in the flat and horizontal positions
- Fillet welds in the flat position

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- Fillet welds in the horizontal position
- Fillet welds in the vertical position
- Groove welds in the flat position
- Groove welds in the horizontal position
- Groove welds in the vertical position

Shop/Lab Practices: FCAW Welds on Mild Steel

This module is designed to help you develop your hand skills in performing fillet welds and fillet/groove combination welds on mild steel using the FCAW process. Techniques that you develop with FCAW can be applied to other wire feed processes and material types. The recommended progression is to perform the following projects in the order shown until you have reached an acceptable level of competency:

- Surfacing beads in the flat and horizontal positions
- Fillet weld in the 1F, 2F and 3F positions
- Fillet/groove weld in the 1G, 2G and 3G positions with backing

Shop/Lab Practices: Combined GMAW and FCAW Welds on Mild Steel

This module lays out industry-accepted welding procedures that combine the GMAW and FCAW processes. It is recommended that you proceed through the prescribed projects in the following order:

- Flat position groove weld on mild steel
- Horizontal position groove weld on mild steel
- Vertical position groove weld on mild steel

Mathematics

In this module, you will review several areas of math including: working with proper and improper fractions, decimals, percentage and ratios, geometric formulas and metric and imperial measurement. These skills are important to ensure accuracy and efficiency in the workplace. You will review your mathematical skills using practical, trade-related questions.

Fractions

This module is designed to introduce you to proper and improper fractions. It show you how to find common denominators, change fractions to lower and higher terms and change mixed numbers to improper fractions and vice versa. You will also learn how to solve problems using whole numbers and fractions through addition, subtraction, multiplication and division.

Decimals

This module is designed to teach you how to read and write decimal fractions, round decimals to specified place values, convert decimal inches and decimal feet to fractions with practical denominators, convert fractions to decimals and add, subtract, multiply and divide decimals.

Percentages and Ratios

This module is designed to teach you how to solve various problems involving percentages and ratios. First, the module shows you how to express two quantities in the form of a ratio and express two ratios in the form of a proportion to solve trade-related problems. Then you are shown how to convert between fractions and percents and how to convert between decimals and percents to solve related problems. The module then finishes with a section dealing with the solving of percent problems.

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Geometric Formulas

This module teaches you the terminology and concepts needed to identify common formulas and solve problems for finding perimeter, area and volume. You then use the volume calculation for conversions to determine the weight of a solid. You also use the volume calculation for conversions to gallons to find capacity.

Metric and Imperial Measurement

The metric system of measurement has been in use throughout most of the world for almost two hundred years in the areas of science, trades and manufacturing. The advantages of the metric system over the imperial system are that the metric system uses only a limited number of terms and conversion within the metric system is far easier than it is within the imperial system. The metric system has been adapted, to a significant degree, in trades and manufacturing in Canada and the United States. This module introduces you to the commonly used metric units of measurement. It also shows you how to convert within and between metric and imperial units of measurement when dealing with linear measurements, area, volume, or capacity. The content is designed to give you the ability to make calculations using SI and imperial units of measure when dealing with trade-related problems. Upon completion of this module you will be able to solve problems involving metric and imperial measure.

Production and Properties of Metal

This module introduces the production processes for iron and steel using the blast furnace, basic oxygen and electric furnace methods. The module then defines the different types of iron and steel starting with the production of pig iron, which is then refined into cast irons and different types of steels. Once the production methods and types of steel have been discussed, the module describes the mechanical and physical properties of different metals. This module will enable you to identify the production processes and types of iron and steel and identify the mechanical and physical properties of metals.

Distortion

This module begins by defining heat and temperature and then identifies how heat and temperature relate to distortion. The module then identifies the three types of distortion and their causes. The last topic in the module describes how to control distortion using mechanical, procedural and design methods. Upon completion of this module you will be able to identify distortion and methods to control it.

Heat Treatment

This module defines the terms heat and temperature, describes the effects of thermal expansion and contraction and explains the purpose and effects of various preheat, postheat and postweld heat treatments. This module will enable you to identify the effects of heat treatments on carbon steels.

Work Placement

Experience on the job is where it all comes together. Students will have the opportunity to work on the job with a certified industry expert who can provide advice and guidance as you start your new career in the Welder/metal fabricator trade. The expert will evaluate your knowledge and abilities as part of this work term.

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