

SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO



COURSE OUTLINE

COURSE TITLE: Welding
CODE NO. : WLD121 **SEMESTER:** ONE
PROGRAM: Mechanical Engineering Technician - Manufacturing
Mechanical Techniques – Millwright & Machine Shop
AUTHOR: Cliff Moss
DATE: September 2012 **PREVIOUS OUTLINE DATED:** January 2011

APPROVED:

“Corey Meunier”

CHAIR

DATE

TOTAL CREDITS: TWO
PREREQUISITE(S): NIL
HOURS/WEEK: TWO

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I. COURSE DESCRIPTION:

A trades curriculum that has been designed to provide students with a combination of theoretical knowledge and hands on skill in relation to the safe use and operation of both OFG / SMA welding, cutting and heating equipment.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

Upon successful completion of this course, the student will demonstrate the ability to:

1. *Personal Protective Equipment for Oxy-Fuel Gas Welding Cutting and Heating Operations.*Potential Elements of the Performance:

- identify proper eye, hand and face protection
- identify proper footwear and clothing
- identify and select filter lenses
- describe the effects of exposure to infra red radiation
- locate and identify shop ventilation controls
- locate and identify emergency exits
- locate and identify manifold shut-off valves for the shop gas system
- understand emergency shop evacuation procedures

2. *Construction of Oxygen Acetylene and other Fuel Gas Cylinders.*Potential Elements of the Performance:

- describe the physical construction of both acetylene and oxygen cylinders
- locate and identify the built-in safety devices for both acetylene and oxygen cylinders
- identify both acetylene and oxygen cylinders, hoses, regulators and fittings
- identify basic physical properties and dangers associated with the use of acetylene gas
- identify basic physical properties and dangers associated with the use of oxygen gas
- describe proper procedures for cylinder handling
- pressurize and purge regulators, hoses, torch body and tips
- explain the dangers associated to the hazards of backfire and flashback
- explain the correct safe response to backfire and flashback
- perform specified procedures for flame ignition and adjustment

3. Observe Demonstrations of the Braze Welding and Fusion Welding Processes c/w their Required Equipment.

Potential Elements of the Performance:

- observe and identify fusion welding and braze welding equipment to include:
 - gas supply (cylinders vs manifold lines)
 - regulators
 - hoses
 - torch handles
 - welding tips
 - filler metals
 - face and eye protection
- observe procedures for setting up, pressurizing, purging and shutting down oxyacetylene welding equipment
- describe potential fire, fume and explosion hazards associated with the welding, flame cutting and heating of metals
- observe and identify common welding techniques to include:
 - base metal cleaning and preheating
 - fusion welding of a mild steel bead and joint
 - destructive testing of same
 - braze welding of a mild steel bead and joint
 - destructive testing of same
- complete a 'Demonstration Report Form' on the above course material

4. Perform Flame Cutting Operations on Mild Steel.

- observe and identify flame cutting equipment to include:
 - gas supply (cylinders vs manifold lines)
 - regulators
 - hoses
 - torch handles
 - cutting tips
 - face and eye protection
- observe procedures for setting up, pressurizing, purging and shutting down oxyacetylene flame cutting equipment
- perform a routine inspection of individual workstation to determine the condition of the torch body, hoses, regulators and tips
- correct / report workstation deficiencies prior to the commencement of shop assignments
- perform flame cutting exercises on mild steel to include
 - square cut a straight line
 - square cut an 'S' shaped line
 - bevel cut a straight line
 - pierce mild steel and cut holes

5. Arc Welding Terms and Equipment.Potential Elements of the Performance:

- Define or describe the following terms
 - Fusion
 - Penetration
 - Leg Size
 - Profile
 - Defect / Discontinuity
- Describe the Basic Principles behind each of the following:
 - SMAW Process
 - Welding Current and Polarity
 - AC and DC Welding Machines
 - Arc Blow

6. CAS and AWS Classification of SMAW Electrodes.Potential Elements of the Performance:

- identify, select electrodes by
 - Classification
 - Diameter
 - Desired Weld Appearance
- Identify and select the correct operating current for electrodes based upon
 - Diameter
 - Joint Design
 - Required Strength
- Identify the correct storage and handling procedures for each of the following electrode types
 - Low Hydrogen
 - Non-Low Hydrogen

7. Arc Welding Operations.Potential Elements of the Performance

- adjust SMAW equipment and settings according to the demands of single and multi-pass fillet and groove welds
- deposit single and multi-pass fillet welds on mild steel
- deposit single and multi-pass groove welds on mild steel
- identify and troubleshoot the cause(s) of weld defects
- identify and explain limited repair and service activities related to electrode cables, holders, welding machines and protective equipment

III. TOPICS:

1. PERSONAL PROTECTIVE EQUIPMENT AND SAFETY
2. CYLINDER CONSTRUCTION, OPERATION AND SAFE USE
3. GAS WELDING, BRAZE WELDING, FLAME CUTTING, AND HEATING OPERATIONS
4. ARC WELDING TERMS AND EQUIPMENT
5. SMAW ELECTRODES
6. ARC WELDING OPERATIONS

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

- Impact Resistant Safety Glasses (CSA Approved)
- High Cut (6 inch) Safety Work Boot (CSA Approved)
- Weld Gloves (CSA Approved)
- Modules: Course Pack WLD121

V. EVALUATION PROCESS/GRADING SYSTEM:Part 1 - NOTES:

1. Re-writes are NOT allowed for any written assignment, quiz or test.
2. Repeats are NOT allowed for any shop test
3. Course attendance is mandatory. One percent (1 %) per hour will be Deducted from the final course grade for apprentices with more than 4 hours of unexcused* absence.

Any absence without a written, valid reason will be deemed unexcused.

Valid reasons would include:

- Doctor's note
- Apprenticeship Ministry note
- Family Death or Serious Illness supported by a written note.

Part 2 – FINAL COURSE GRADES:

The final course grade will be determined by means of the following list of weighted factors:

<i>Factor</i>	<i>Value</i>
Shop Assignments	65 %
Theory Quiz & Test	35 %
Attendance	-1% per Unexcused Hour
Shop Clean-up	-1% per Incident

The following semester grades will be assigned to students:

<u>Grade</u>	<u>Definition</u>	<u>Grade Point Equivalent</u>
A+	90 - 100%	4.00
A	80 - 89%	
B	70 - 79%	3.00
C	60 - 69%	2.00
F (Fail)	59% and below	0.00
CR (Credit)	Credit for diploma requirements has been awarded.	
S	Satisfactory achievement in field /clinical placement or non-graded subject area.	
U	Unsatisfactory achievement in field/clinical placement or non-graded subject area.	
X	A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.	
NR	Grade not reported to Registrar's office.	
W	Student has withdrawn from the course without academic penalty.	

VI. SPECIAL NOTES:

Attendance:

Sault College is committed to student success. There is a direct correlation between academic performance and class attendance; therefore, for the benefit of all its constituents, all students are encouraged to attend all of their scheduled learning and evaluation sessions. This implies arriving on time and remaining for the duration of the scheduled session.

It is the departmental policy that once the classroom door has been closed, the learning process has begun. Late arrivers will not be granted admission to the room.

VII. COURSE OUTLINE ADDENDUM:

The provisions contained in the addendum located on the portal form part of this course outline.