SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

COURSE TITLE:	WELDING		
CODE NO. :	IRN620	**SEMESTER:**	N/A
PROGRAM:	Ironworker Apprentice – Basic Level		
AUTHOR: **INSTRUCTOR:**	Bill Hanchuck		
DATE:	January 2017	**PREVIOUS OUTLINE DATED:**	March 2016
APPROVED:	*"Corey Meunier"* **CHAIR**		Dec '16
TOTAL CREDITS:	6		
PREREQUISITE(S):	Acceptance into the Ironworker Training Program		
HOURS/WEEK:	5		

I. COURSE DESCRIPTION: COURSE DESCRIPTION: This curriculum has been designed to provide apprentices with a combination of theoretical knowledge and practical (hands on) skill in the safe use and operation of OFG and SMAW welding and cutting equipment. Its terminal objective is to develop the skills necessary to pass a CWB Plate Test.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

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

1. ***Identify equipment and procedures required to assure personal safety while engaged in shop activities.***

   Potential Elements of the Performance:

   - identify proper work boots, gloves and eye protection
   - identify recommended fabrics and materials for personal protective clothing
   - understand the general organization and layout of the welding shop facility
   - locate and identify shop lighting and ventilation controls
   - locate and identify emergency exits
   - identify and select proper shades of welding / cutting lens
   - identify, select and adjust helmets for proper fit and vision
   - understand procedures for evacuation of shop areas in the case of emergencies

2. ***Identify and describe oxyacetylene cutting and heating equipment and accessories including their construction, operation, assembly and disassembly.***

   Potential Elements of the Performance:

   - cylinder identification and general construction
   - pressure regulators
   - manual valves
   - manifold systems
   - gages and hoses
   - torch body
   - tips for cutting, heating, welding
   - cutting attachments
   - flashback arrestors
   - check equipment for safe operating condition

3. ***Demonstrate and describe the process of Oxyacetylene Flame Cutting and Heating.***
   Potential Elements of the Performance:
   - set up equipment for oxyacetylene cutting
   - select tip size and set cutting pressures for a given thickness of metal
   - check equipment for safe operation
   - pressurize, ignite, adjust and safely operate a cutting torch
   - perform typical flame cutting operations to include
     - square cut c/w re-start
     - piercing and making holes
     - bevel cut c/w re-start

4. ***Demonstrate and describe the process of Oxyacetylene Fusion Welding and Oxyacetylene Braze Welding.***
   Potential Elements of the Performance:
   - set up equipment for oxyacetylene fusion welding
   - set up equipment for oxyacetylene braze welding
   - select tip size and set welding pressures for a given thickness of metal
   - pressurize, ignite, adjust and safely operate a welding torch
   - check equipment for safe operation
   - deposit fusion weld beads on mild steel sheet metal with filler rod
   - test weld beads for fusion and ductility
   - deposit brass beads on mild steel sheet metal
   - test weld beads for adhesion and ductility

5. ***Demonstrate and describe how to set up and operate a typical SMAW Workstation.***
   - Potential Elements of the Performance:
   - identify, select and adjust welding helmets and lenses
   - identify SMAW electrodes according to type, size, current type, polarity and welding position according to AWS and CSA designation
   - identify and describe the various types of welding machine according to construction, duty cycle and current type
   - perform a routine inspection of assigned workstation to determine the condition of welding machine, cables, electrode holders and related equipment
   - understand the hazards of open circuit voltage (OCV) and arc voltage
   - identify / set welding machine controls to their designated value(s)
   - describe techniques for arc ignition, electrode manipulation and travel speeds
   - produce trial weld beads to identify possible defects and verify current settings

6. ***Demonstrate the ability to produce sound welds as well as identify / troubleshoot and make corrective adjustments for weld defects.***
Potential Elements of the Performance:
- describe potential fire, fume and explosion hazards associated to the SMAW process
- perform appropriate adjustments to SMAW equipment specific to the demands of single and multi-pass fillet welds
- make single and multi-pass fillet welds on mild steel
- perform appropriate adjustments to SMAW equipment specific to the demands of single and multi-pass groove welds
- make single and multi-pass groove welds on mild steel
- perform destructive tests on welded joints to verify overall soundness
- describe, identify and take corrective actions for common weld defects

7. ***Demonstrate the ability to pass a CWB Plate Test****
Potential Elements of Performance:
- describe the physical dimensions of the CWB test plate assembly including:
  - bead sequence
  - position and number of stop / restarts
  - the acceptance criteria for the size and shape of the completed weld
- describe the physical bend test procedure to include:
  - plate thickness, width and length
  - bevel angle
  - root opening
  - number and size of bend test coupons
- describe the welding procedure to include:
  - preparation and condition of bend coupons
  - identification of face vs root bend coupons
  - acceptance criteria for possible defects

*S-Class Plate Test for Apprentices w/o a valid S-Class CWB Ticket
*T-Class Plate Test for Apprentices with a valid S-Class CWB Ticket

III. TOPICS:

1. Personal and Shop Safety
2. Cylinder Construction and Safe Operation / Use
3. Flame Cutting Equipment and Techniques
4. Braze Welding and Fusion Welding Equipment and Techniques
5. Shielded Metal Arc Welding Equipment and Techniques
6. CWB Testing

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

1. C.S.A. Approved (High Cut) Safety Work Boots
2. C.S.A. Approved Safety Glasses
3. Appropriate Work Wear – (as per the Welding Department Guidelines)
4. Welding Gloves (Gauntlet Type)
5. Theory Modules: Course Pack IRN604

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:

Factor	***Value***	
Shop Assignments	35 %	
CWB S-Class Test(s)	35 %	(No valid CWB S-Class Ticket)
CWB T-Class Test(s)	35 %	(Possess a valid CWB S-Class Ticket)
Theory Quiz & Test	30 %	
Attendance	-1% per Unexcused Hour	

If you have a valid SMAW – CWB S-Class ticket in the required position(s) you will be required to pass the CWB T-Class Test(s) in the required position(s).

The following semester grades will be assigned to students:

Grade	**Definition**	*Grade Point Equivalent*
A+	90 – 100%	4.00
A	80 – 89%	
B	70 - 79%	3.00
C	60 - 69%	2.00
D	50 – 59%	1.00
F (Fail)	49% 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.