

#172'

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

WELDING

Course Title:

Code No . :

HDE-APPRENTICE BASIC

Program:

Semester:

1989 05 19

Date:

Bob Senechal

Author:

New!

Revision: XX

APPROVED;

  
Chairperson 

  
Date **^Wii;**

WELDING

Course Name

Course Number

**PHILOSOPHY/GOALS;**

This course of study provides students with a basic level of skills in dealing with oxy-acetylene welding equipment. It is intended to provide the student with an understanding of metallurgy as it relates to welding.

**METHODS OF ASSESSMENT (GRADING METHOD);**

MARKING SYSTEM	2 - Theory Tests	-	30%
	Skill Evaluation	-	60%
A -- 85% +	Attendance/Attitude	-	10%
B -- 75% - 84%			
C -- 60% - 74%	TOTAL	-	100%
D -- 50% - 59%			
F -- Repeat			

Instructors should provide marks in percentage. A mark of "D" must be balanced with a "B" (in another subject if necessary) to obtain a passing grade of "C" - average. Instructors should try for a class average of between 70 - 75%.

The instructor will determine which practical exercises will be used for marking.

**TEXTBOOK(S);**

I.A.S. and notes.

Students should be given a copy of the course outline.

**OBJECTIVES;**

The objectives are to develop good welding and cutting skills and non-fusion welding practices.

Also included are simple identification methods used on metals along with a basic introduction to physical metallurgy.

The student should realize that all objectives may not necessarily be met due to time constraints.

**SUMMARY - HDE APPRENTICE - BASIC**

<b>TOPIC NO.</b>	<b>PERIODS</b>	<b>TOPIC DESCRIPTION</b>	<b>REFERENCE</b>
	T-THEORY L-LAB		
1a	1/2T	Orientation to program.	O.A.W.
b		Introduction and scope: fusion welding, non-fusion welding, cutting, heating.	I.A.S.#1
2a	IL	Assembling and handling of equipment.	Demo/Note
b		Construction and storage of equipment.	
c		Repairs to accessories.	Demo
d	1/2T	Types of oxy-actylene flames and fuel mixtures.	O.A.W. I.A.S.#2
e	1/2T	Welding terms, positions, joints	O.A.W. I.A.S.#3
f		Filler metals and their selection.	Notes
g		Weld faults.	O.A.W. I.A.S.#4
3	8L	Fusion welding practices.	Notes/Demo
4		Non-fusion welding practices.	O.A.W. I.A.S.#5
a	2L	Braze welding.	Notes/Demo
b	IL	Brazing	
c	IL	Soldering	
5	2L	Cutting practices.	O.A.W. I.A.S.#6 Demo
6	1/2L	Distortion of metals.	O.A.W. I.A.S.#7 Demo
7	2L	Basic heat treatment of metals.	O.A.W. I.A.S.#8 Demo
8a	2T	Intoduction to physical metallurgy.	O.A.W. I.A.S.#9
b	1/2L	Identification of metals.	
9	1/2T	Written Test	
<b>TOTAL HRS.</b>	<b>4T, 20L</b>	<b>- 12 WEEKS</b>	

TOPIC NO.	PERIODS	TOPIC DESCRIPTION	REFERENCE
	T-THEORY L-LAB		
1a	1/2T	Orientation to program. <ul style="list-style-type: none"> <li>- outline of topics to be covered</li> <li>- grading system: A,B,C,D,F.</li> <li>- method of evaluation</li> <li>- testing modes, dates</li> <li>- shop safety and regulations</li> <li>- personal safety</li> <li>- repair of shop equipment</li> </ul>	O.A.W. I.A.S.#1
b		Introduction to O.A.W. <ul style="list-style-type: none"> <li>- Scope: fusion non-fusion culling heating</li> </ul>	
2a	IL	Assembling and handling of equipment. <ul style="list-style-type: none"> <li>- assemble and disassemble hoses, regulators, torches, tips</li> <li>- identify and change "O" rings</li> <li>- adjust goggles, strikers</li> <li>- transport welding cylinders and cart</li> </ul>	Notes/Demo
b		Construction of equipment. <ul style="list-style-type: none"> <li>- study cross-section of cylinders</li> <li>- location of safety devices</li> <li>- identification and marking of cylinders</li> </ul>	Notes/Demo
c		Repairs to accessories. <ul style="list-style-type: none"> <li>- hose splicing, crimping tools, hose diameters</li> </ul>	Demo
d	1/2T	Types of O.A. flames and fuel mixtures. <ul style="list-style-type: none"> <li>- lighting torches and adjustment</li> <li>- flame type and effect on weld puddle</li> <li>- characteristics and uses of other fuel gases: Mapp, natural gas, propane, air-acetylene</li> <li>- welding and cutting on containers</li> </ul>	O.A.W. I.A.S.#2 Notes/Demo

TOPIC NO.	PERIODS	TOPIC DESCRIPTION	REFERENCE
	T-THEORY L-LAB		
2e	1/2T	<p>Welding terms, positions, joints.</p> <ul style="list-style-type: none"> <li>- 3 types of welds: bead, groove and fillet</li> <li>- explanation of face, root, throat of weld</li> <li>- 5 types of joints: butt, lap, tee, corner, edge</li> <li>- weld positions in respect to fillet welds</li> <li>- explanation of joint penetration and fusion</li> </ul>	O.A.W. I.A.S.#3
f		<p>Filler metals and their selection.</p> <ul style="list-style-type: none"> <li>- RG45, RG60</li> <li>- tensile strength, ductility</li> <li>- weld soundness in respect to SI content</li> </ul>	Notes
g		<p>Weld faults: identification and prevention.</p> <ul style="list-style-type: none"> <li>- appearance, overlap, undercut, lack of fusion, brittle welds, porosity, excessive convexity, concavity</li> </ul>	O.A.W. I.A.S.#4 Notes
3	8L	<p>Fusion welding practices, 16 gauge metal.</p> <ul style="list-style-type: none"> <li>- beads, no rod and with rod</li> <li>- edge joint without rod</li> <li>- outside corner joint, with rod</li> <li>- butt joint with rod</li> <li>- lap joint with rod</li> </ul>	Notes/Demo
4a	2L	<p>Non-fusion welding practices.</p> <ul style="list-style-type: none"> <li>- braze welding: definition, uses</li> <li>- advantages and disadvantages</li> <li>- braze weld tee-joint (both sides) 2F; 3F</li> </ul>	I.A.S.#5 Notes/Demo
b	IL	<ul style="list-style-type: none"> <li>- brazing, definition; uses</li> <li>- braze tee-joint 16 gauge metal using Allstate #45 (RB45)</li> <li>- safety: fumes, fluxes</li> </ul>	
c		<p>Soldering</p> <ul style="list-style-type: none"> <li>- definition; uses</li> <li>- fluxes</li> <li>- soldering equipment</li> </ul>	

TOPIC NO.	PERIODS	TOPIC DESCRIPTION	REFERENCE
#	T-THEORY L-LAB		
	1L	- solder steel to steel - solder wire connection	
5	2L	Cutting practices. - manual cutting, with and without guide bar - piercing - bolt cutting - cutability of metals	O.A.W. I.A.S.#6 Demo
6	1/2T	Distortion of metals. - upsetting - heat input - neutral axis - heating for shrink fits	O.A.W. I.A.S.#7 Demo
7	2L	Basic heat treatment for metals. - effect of heat on: grain size and microstructure - forging, hardening, tempering a cold chisel - case hardening	O.A.W. I.A.S.#8 Demo
8a	2T	Introduction to physical metallurgy. - tensile strength - yield strength - ductility - elasticity - toughness - impact strength - factor of safety - allowable stress	O.A.W. I.A.S.#9 Metals and How to Weld Them.
b	1/2L	Identification of metals. - flame test - spark test - appearance, density of carbon steels - L.A.H.S. steels - stainless steels - aluminum, magnesium, white metal - copper based alloys - HR & CR sheet steel	
TOTAL HRS. AT, 20L - 12 WEEKS			