SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title: Fundamentals of Arc and Gas Welding (SHOP & THEORY)

Code No*: MET 117-03 (THEORY)

Program: WELDING AND FABRICATING

Semester: ONE

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APPROVED: Chairperson Date: Sept 10/87

Fundamentals of Arc & Gas Welding MET **117-03**

Course Name **Course Number**

PHILOSOPHY/GOALS;

This course introduces the student to basic gas (O.A.W.) and arc (S.M.A.W.) welding practices with emphasis on skill development, personal and shop safety, as well as proper use of tools and equipment.

METHODS OF ASSESSMENT (GRADING METHOD):

a) Sault College Policy/Procedure No. l-G-6, Academic Section
b) Computer marked tests - 70% minimum
c) Overall grading - PRACTICAL - 40%
THEORY - 40%
ATTENDANCE, SAFETY, ATTITUDE - 20%

GRADING:

A+ = 95 - 100%
A = 85 - 94%
B = 75 - 84%
C = 60 - 74%

TEXTBOOK(S):

MODULES: CCA MFA
CCF CCG
CCJ CCK
MFC MFE (SELECTED EXERCISES)

OBJECTIVES:

The general objective is to develop a student with sound knowledge of the equipment and processes used. Specifically, he/she should be able to weld in position using gas and arc welding processes.

He/she will be required to pass the CWB class S-F test.

MODULE CCA: DESCRIBE SAFE WORK PRACTICES

UNIT	LEARNING TASK
01	1) Write and learn definitions for specific words and terms used within the Act.
	2) Describe the duties, responsibilities and rights of both the employer and employee in accordance with the Act.
02	1) Describe safety requirements for personal wearing apparel.
	2) Describe basic personal protective equipment.
	3) State general rules of conduct for all trades areas
	4) Describe general procedures for good housekeeping.
	5) Describe general shop ventilation requirements.
	6) Describe basic hand tool safety.
	7) Describe basic power tool safety.
	8) Describe general requirements for dealing with electrical hazards.
	9) Describe lock-out/tag-out procedures.
03	2) Describe causes of back injuries stated in W.C.B.'s "Back Talk" booklet.
04	1) List the three components that must be present before a fire can occur.
	2) Identify Class A, B, C and D fires and state the type of extinguisher that should be used to put out each class of fire.
	3) State the fire safety precautions to be observed while working near, handling or storing: - flammable liquids or gases - oily rages - paper, sawdust, wood, etc. - electrical apparatus
	4) Identify the location of fire extinguishing equipment and fire alarms in the building.

UNI* '	LEARNING TASK
08	1) Identify Welding Shop rules and regulations.
	2) Identify safe working habits to accepted trade standards.
	3) Identify types of protective clothing required in Welding.
	4) Identify personal-protective equipment required in Welding.
	5) Identify ventilation requirements for Welding, Cutting and General Shop Work.

MODULE CCF: USE HAND AND MEASURING TOOLS

03	1)	Identify combination, adjustable, socket, pipe and hexagon key wrenches.
	2)	Identify the ball peen hammer, soft face hammer, flat cold chisel, taper punch and pin punch.
	3)	Identify the combination slip-joint, interlocking slip-joint, needle nose, round nose, side or diagonal cutting and locking pliers.
	4)	Identify the hacksaw, files and emery cloth.
	5)	Identify the bench vise and machine vise.
	6)	Describe the care and maintenance of basic mechanics handtools.
04	1)	Produce an electrode template/fillet weld gauge (see Machine Shop)

MODULE CCJ: OXYACETYLENE CUTTING AND WELDING

01	1)	Identify gases used in oxy-fuel cutting.
	2)	Identify oxy-fuel cylinders, valves and safety devices.
	3)	Identify oxygen and acetylene regulators
	4)	Identify hoses and oxy-fuel fittings.

UNIT	LEARNING TASK	
	5)	Identify torch line explosions and reverse flow control valves,
	7)	List the components of an oxy-acetylene unit.
	8)	Describe safe procedures for handling and storing oxy-fuel components.
	9)	Describe safe procedures for handling, storing and transporting oxy-fuel cylinders.
02	1)	Assemble, test, start up, shut down and disassemble an oxyacetylene unit.
03	1)	Describe oxy-fuel cutting.
	2)	Identify and review safety procedures for oxy-fuel cutting and for the cutting and welding of containers
	3)	Describe and identify factors that affect cutting.
	4)	Perform guided cuts, freehand cuts and pierce holes in mild steel plate.
	5)	Perform a cutting test on mild steel plate.
04	1)	Describe the principles of fusion.
	2)	Identify factors affecting fusion welding.
	3)	Perform six (6) practical fusion welding tasks on gauge metal.
05	1)	Describe the principles of braze welding.
	2)	Perform three (3) practical braze welding tasks on gauge metal.

MODULE MFC: OXY-FUEL GAS WELDING

03	1)	Study welding practices, positions, weld terms and joints.
	2)	OMIT
	3)	OMIT
	4)	Weld bead and joints in vertical position.

UNIT	LEARNING TASK
05	1) OMIT
	2) Braze welding practice, lap and tee joint, horizontal and vertical.
	3) Braze weld butt joint; 3/8" plate; bend test.
09	1) Study pipe sizes, terminology, joint preparation, torch angles and basic weld metallurgy.
	2) Weld beads on 1" sch. 40 pipe in 1G, 2G, 5G position and complete a 5G - position test weld according to ASTM requirements.
10	1) Study soldering principles, joint types and strength, fillers, fluxes and safety.
	2) Solder copper tubing, steel, stainless steel, Al. strip, wire or copper cable.
11	1) Study brazing definition and principles, joint-strength relationship, filler, fluxes, safety.
	2) Braze steel, copper, st. steel, aluminum and combinations of these metals.
12	1) Study hardfacing principles and materials; repair welding of cast iron, aluminum, white metal, copper alloys and their identification.
	2) Practice hardfacing and do repair welding of selected projects.
	3) Identify metals.

MODULE MFA: SAFETY AND POWER TOOLS

1) Preparation for shop entry.

2) Safe use and operation of the radiagraph.

3) Safe use and operation of the portable disc grinder

4) Safe use and operation of the pedestal grinder.

5) Safe use and operation of the hydraulic press.

AobOLE CCG: USE POWER TOOLS

UNIT	LEARNING TASK
01	4) Describe portable drills*
	5) Select drill bits.
	6) Describe safety requirements for using portable power tools,
	7) Use the portable drill.
02	1) Describe the power hacksaw.
	2) Describe the power cut-off saw.
	3) Describe the drill press.
	4) Use the drill press.
03	1) Describe portable power grinders.
	2) Describe the bench grinder.
	3) Describe grinding wheels.

MODULE CCK: BASIC ARC WELDING

01	1) Describe the principles of SMAW and the basic welding circuit.
	2) Identify the safety rules, accessories, electrical hazards and protective equipment.
02	1) Identify and operate arc welding equipment and accessories in a proper, safe manner.
	2) Identify size and use of electrodes with initial arc welding exercises.
	3) Weld stringer beads, weave passes and perform surface (build-up) exercises.
	4) Weld fillets in the flat position.
	5) Complete fillets in the flat position.
	6) Weld Horizontal Fillets on 3/8" plate.
	7) Weld Horizontal fillets on 16 ga. sheet metal.
	8) Weld Horizontal beads and pad.

LEARNING TASK

9) Weld vertical beads + weaves*

10) Weld vertical up fillets.

11) Weld vertical down fillets.

1) Study weld faults:

   a) Identify and describe weld faults.
   b) Describe arc blow, causes and reduction.
   c) Describe distortion, causes and prevention.

2) Study basic welds, joint design:

   a) Describe basic types of joints and welds.
   b) Identify the fillet weld types and terms.
   c) Identify four welding positions in relation with joint placement.

3) Study electrode selection:

   a) Identify eight factors to be considered in electrode selection.
   b) Describe three functions of coatings.
   c) List the use, characteristics and applications of the following electrodes: E6010, E6011, E6013, E7024, E7018.
   d) Describe their special storage needs.

4) Study elementary electrical concepts.

   a) Define elementary electrical concepts.
   b) Identify three basic types of welding machines.
   c) Describe polarity, its effects and O.C.V. adjustments with generators.