

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title: WELDING

Code No, : MET103-2

Program: MACHINE SHOP

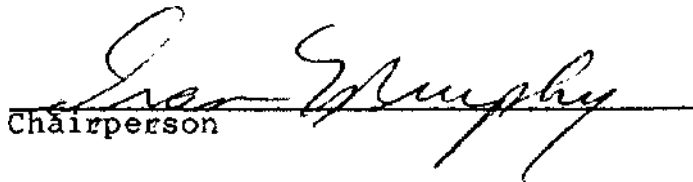
semester: ONE

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New: Revision: XX

APPROVED:

  
Chairperson

Date V ' / /

Course Name

Course Number

**PHILOSOPHY/GOALS**

Basic welding skills and knowledge of the operation of welding equipment are needed by the machinist.

This course will serve as an introduction to general welding practices in a machine shop.

**METHODS OF ASSESSMENT (GRADING METHOD)**

2 Theory Tests	30%
Practical Skill	60%
Attendance/Attitude	10%
TOTAL	100%

**TEXTBOOK(S)**

I.A.S. Instruction Aid Sheets (handed out)  
and notes taken by students.

Students should be given the course outline summary for MET103-2.

**OBJECTIVES;**

The basic objective is to develop a student with safe work habits and sound skills in the use of O.A. welding and cutting equipment, stick electrode welding in the flat position, and in addition gain an appreciation of Mig welding and Carbon Arc gouging.

The passing grade is a "C".

SUMMARY OF MET103-2

TOPIC NO,	PERIODS	TOPIC DESCRIPTION	REFERENCE
	THEO/LAB		
1a	1/2	Orientation to program.	I.A.S.#1
b		Introduction to O.A. Welding,	
2a	1/2	Assembling and handling of equipment.	Notes
b		Construction of equipment*	Notes
c		Repairs to accessories.	Demo
d		Types of O. A. flames and fuel mixtures.	I.A.S.#2
e		Welding Terms, positions, joints.	I.A.S.#3
f		Filler metals and their selection	Notes
g		Weld faults.	I.A.S.#4
3		Fusion welding practices.	Notes/Demo
4		Non-fusion welding practices.	I.A.S,#5
5		Cutting practices.	I.A.S.#6 Notes/Demo
	1/2	Written Test	
TOTAL HRS	2	10	6 WEEKS
7a	1/2	Introduction to SMAW.	I.A.S.#7
		Types of welding machines and their adjustments.	Demo
b		Electrical principles.	I.A.S.#8 Demo
c		Repairs to accessories.	Demo
	12	SMAW practices.	I.A.S.#9 Demo
9a	1	Selection of welding machines.	I.A.S.#10
b		Selection of filler metals.	I.A.S.#11
c		Weld faults, recognition, prevention.	I.A.S.#12
d		Repair welding practices.	I.A.S.#13 Demo
e		Welding symbols.	I.A.S.I14
10	2	GMAW practice.	I.A.S.#15 Demo
11	2	Carbon arc cutting practice(AAC)	I.A.S.#16 Demo
12	1/2	Testing	
TOTAL HRS	2	16	9 WEEKS

TOPIC NO.	PERIODS	TOPIC DESCRIPTION	REFERENCE
	THEO/LAB		
1a	1/2	Orientation to program. <ul style="list-style-type: none"> <li>- outline of topics to be covered</li> <li>- grading system: A,B,C,R,I,X</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  cutting  heating</li> </ul>	
2a	1/2	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		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
	THEO/LAB	Welding terms, positions, joints. <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
		Filler metals and their selection. <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
		Weld faults: identification and prevention. <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
		Fusion welding practices, 16 gauge metal. <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>	
		Non-fusion welding practices. <ul style="list-style-type: none"> <li>- braze welding: definition, uses</li> <li>- advantages and disadvantages</li> <li>- braze weld tee-joint(both sides)</li> <li>- brazing<sub>p</sub> definition; uses</li> <li>- braze tee-joint 16 gauge metal using Allstate #45 (RB45)</li> </ul>	O.A.W. I.A.S.#5 Notes/Demo

TOPIC NO.	PERIODS	TOPIC DESCRIPTION	REFERENCE
	THEO/LAB		
		Cutting practices: scope.	O.A.W.
		- manual straight-line cutting with and without guide bar	I.A.S.#6
		- bevel cutting, mitre cutting	Notes/Demo
		- piercing	
		- cutting of round stock	
6	1/2	Written Test Summary	
7a	1/2	Introduction to SMAW.	O.A.W.
		- types of welding machines: transformer - AC	I.A.S.#7
		transformer/rectifier - AC/DC	Demo
		generator - DC	
		- current adjustment on Lincoln, Hobart and Miller machines	
		Electrical principles.	O.A.W
		- polarity, OCV, duty cycle	I.A.S #8
		- OCV adjustment on generators	Demo
		- volt-ampere characteristics	Demo
		Repairs to accessories.	Demo
		- helmet, cables, holders	
	12	SMAW practices.	SMAW
		- bead and weave E6010/6011; 8/1 - 5/32	I.A.S.#1
		- bead and weave E7024/7028; 1/8 - 5/32	
		- bead and weave E7018; 1/8 •- 5/32	
		- pad; 1/8 E7024; 1/8 E7018; beads <sub>f</sub> flat position	
		- 2F tee-joint; 5/16" leg; 1/8 E7018	
		- horizontal pad; 1/8 E7018	
		- vertical up bead and weave; 1/8 E7018	
		- 3F; bead and weave; 1/8 E7018	

TOPIC NO.	PERIODS	TOPIC DESCRIPTION	REFERENCE
	THEO/LAB		
9a		<p>Selection of welding machines.</p> <ul style="list-style-type: none"> <li>- electrical input, phase requirement</li> <li>- output and duty cycle</li> <li>- constant current and variable voltage machines</li> <li>- constant voltage and variable current machines</li> </ul>	<p>SMAW I.A.S.#2</p>
		<p>Selection of filler metals machine</p> <ul style="list-style-type: none"> <li>- mechanical properties: tensile strength, ductility, impact strength, yield strength</li> <li>- operating characteristics of electrodes</li> <li>- rod diameters</li> <li>- AWS/CSA classifications of mild steel electrodes</li> <li>- L.A.H.S. electrodes</li> <li>- tool steel electrodes</li> <li>- stainless steel electrodes</li> <li>- cast iron electrodes</li> <li>- aluminum electrodes.</li> </ul>	<p>SMAW I.A.S.#3</p>
		<p>Weld faults; recognition - copper alloy electrodes prevention.</p> <ul style="list-style-type: none"> <li>- weld profile, overlap, undercut, crater cracks, underbead cracking, porosity, arcblow</li> </ul>	<p>SMAW I.A.S.#4</p>
		<p>Repair welding practices.</p> <ul style="list-style-type: none"> <li>- distortion; occurrence; prevention</li> <li>- welding broken tool steel in the hardened and tempered condition</li> </ul>	<p>SMAW I.A.S.#5 Metals and How to Weld Them P. 339</p>

TOPIC NO.	PERIODS	TOPIC DESCRIPTION	REFERENCE
	THEO/LAD	welding cast iron, aluminum, stainless steel	
		Welding symbols. - reference line and location of weld symbols - groove " niii'1 Till<>t w«%1 (V) - htrRmit't-ant" woir) symbol^	SMAW I.A.S.#6
10	2	GMAW practice.	SMAW I.A.S.#7 Demo
11	2	AAC-Carbon Arc Cutting	SMAW I.A.S.I8 Demo
12	1/2	Testing	
TOTAL HRS.	2 16	- 9 WEEKS	