SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO

Sault College

COURSE OUTLINE

COURSE TITLE:	WELD QUALITY and INSPECTION		
CODE NO. :	ASR114	**SEMESTER:**	One (1)
PROGRAM:	Aircraft Structural Repair		
AUTHOR:	Dennis Clement-Socchia		
DATE:	May 2003	**PREVIOUS OUTLINE DATED:**	May 2002
APPROVED:			
	_____ **DEAN**		_____ **DATE**
TOTAL CREDITS:	2		
PREREQUISITE(S):	None		
HOURS/WEEK:	2		

I. COURSE DESCRIPTION: This course will introduce the topics of 'weld quality' and 'visual inspection' using the requirements of AC 43.13-1A as a reference and source of technical information. Students will be required to produce and / or heat treat samples by means of either the Oxy-Acetylene or the Gas Metal Arc welding processes and subject them to various testing and inspection procedures in order to verify their compliance with inspection guidelines. Shop demonstrations and lectures will be used as the method of course delivery and will be further supported by means of written lab reports and theory testing.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

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

1. ***Demonstrate a sound working knowledge of both Personal and Shop Safety.***

   Potential Elements of the Performance:

   - Identify proper eye, hand and face protection equipment and procedures.
   - Identify proper safety footwear and clothing
   - Locate and identify shop lighting ventilation controls and devices.
   - Understand the dangers associated with
     - Contact Lenses
     - Disposable Lighters
     - Exposed Jewelry
     - Synthetic Clothing
     - Infrared and ultraviolet radiation
     - Welding Flames and Sparks
   - Identify basic physical properties and dangers associated with the use of welding grade oxygen.
   - Identify basic physical properties and dangers associated with the use of acetylene gas.
   - Understand correct emergency procedures for evacuation of shop areas.

2. ***Demonstrate a clear understanding of how to set up and operate Oxy- Acetylene Welding / Heating Equipment***

   Potential Elements of the Performance:

   - Review proper eye, hand and face protection equipment and procedures.
   - Review proper safety footwear and clothing
   - Identify the following list of equipment and component parts:
     - Torch Body and Hoses
     - Welding and Cutting Tips
     - Regulators
     - Spark Lighter
     - Welding Face Shield / Goggles
   - Pressurize and purge regulators, hoses, torch bodies and tips.
   - Understand and explain the dangers associated to the hazards of backfire and flashback.
   - Understand and explain the correct safe response to backfire and flashback.
   - Adjust the torch valves to produce flames designated as carburizing, neutral and oxidizing.
   - Shut down typical oxyacetylene equipment and assigned workstation.

3. ***Demonstrate a clear understanding of the concepts related to Heat Treatment and Mechanical Properties.***

   Potential Elements of the Performance:

   - Define and describe the following terms and processes:
     - Solid Solution
     - Annealing and Normalizing
     - Quenching
     - Tempering and Aging
   - Estimate the effects of the above heat treatments thru the use of shop tests.
   - Define and describe the following mechanical properties:
     - tensile strength and yield strength
     - ductility and brittleness
     - toughness
     - hardness.
   - Identify the presence or absence of a mechanical property in a base metal thru the use of shop tests.
   - Estimate mechanical properties thru the use of standard shop tools and known standards.

4. ***Demonstrate a clear understanding of how to set up and operate Gas Metal Arc Welding Equipment.***

   Potential Elements of the Performance:

   - Review proper eye, hand and face protection equipment and procedures.
   - Review proper safety footwear and clothing
   - Identify the following list of equipment and settings:
     - Welding Machine
     - Wire Feeder
     - Regulator / Flow Meter
     - Shielding Gas Flow Rate
     - Voltage and WFS
     - Welding Face Shield
   - Set up and operate a GMAW unit in order to produce groove and fillet welds.

5. ***Demonstrate a clear understanding of the concepts related to Heat Affected Zone and Distortion***

   Potential Elements of the Performance:

   - Define and describe the term ‘Distortion’
   - Identify the cause and types of distortion
   - Identify and describe the term ‘Neutral Axis’
   - Identify the effect of the ‘Neutral Axis’ location upon distortion
   - Identify the presence and location of a H.A.Z. in a weld sample
   - Identify how the H.A.Z. can affect the strength of a welded member.

6. ***Demonstrate a clear understanding of the concepts related to Weld Inspection.***

   Potential Elements of the Performance

   - Identify methods of destructive and non-destructive testing.
   - Identify and describe typical weld defects and discontinuities
   - Identify criteria for acceptable vs non-acceptable welds
   - Visually examine welds to identify:
     - defects and discontinuities
     - acceptable levels of defects and discontinuities
   - Create written report(s) on visual inspections c/w reasons for
     - accepting welds
     - rejecting welds

III. TOPICS:

1. Personal and Shop Safety
2. Oxy-acetylene Welding and Heating
3. Mechanical Properties and Heat Treating
4. Gas Metal Arc Welding
5. Heat Affected Zone and Distortion
6. Weld Inspection

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

CSA Approved (Impact Resistant) Safety Glasses
CSA Approved (8 inch High Cut) Safety Work Boots
CSA Approved (Gauntlet Type) Welding Gloves
3 inch Diameter Magnifying Glass
Text: "Principles of Industrial Welding"

V. EVALUATION PROCESS/GRADING SYSTEM:

The final course grade shall be determined by means of the following two criteria based upon their described weighted factors:

Shop / Lab Assignments	50%
Theory Tests	50%

Total	100%

While the following semester grades are normally assigned to students in postsecondary courses, Transport Canada requires a minimum grade of 70% for any course that it recognizes. In keeping with their policy, a ***minimum of 70 % (B)is required in order to pass ASR114***.

Grade	Definition	Grade Point Equivalent
A+	90 – 100%	4.00
A	80 – 89%	3.75
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:

Special Needs:
If you are a student with special needs (e.g. physical limitations, visual impairments, hearing impairments, or learning disabilities), you are encouraged to discuss required accommodations with your instructor and/or the Special Needs office. Visit Room E1204 or call Extension 493 so that support services can be arranged for you.

Retention of course outlines:
It is the responsibility of the student to retain all course outlines for possible future use in acquiring advanced standing at other postsecondary institutions.

Plagiarism:
Students should refer to the definition of “academic dishonesty” in *Student Rights and Responsibilities*. Students who engage in “academic dishonesty” will receive an automatic failure for that submission and/or such other penalty, up to and including expulsion from the course/program, as may be decided by the professor/dean. In order to protect students from inadvertent plagiarism, to protect the copyright of the material referenced, and to credit the author of the material, it is the policy of the department to employ a documentation format for referencing source material.

Course outline amendments:
The Professor reserves the right to change the information contained in this course outline depending on the needs of the learner and the availability of resources.

Substitute course information is available in the Registrar's office.

NOTE1: There are no re-writes for theory tests.

NOTE2: Shop and Lab Assignments are due on the day and at the time specified. Late assignments will lose 10% per day late.

VII. PRIOR LEARNING ASSESSMENT:

Students who wish to apply for advanced credit in the course should consult the professor. Credit for prior learning will be given upon successful completion of a challenge exam or portfolio.

VIII. DIRECT CREDIT TRANSFERS:

Students who wish to apply for direct credit transfer (advanced standing) should obtain a direct credit transfer form from the Dean's secretary. Students will be required to provide a transcript and course outline related to the course in question.