

I. COURSE DESCRIPTION:

The objective of this course is to discuss the properties and effects of forming and welding metals and alloys. We will review the steelmaking process, the classification systems and the mechanical and physical characteristics of various metals and alloys. This course will investigate the iron carbon system and the physical metallurgy testing procedures. Practical lab / shop activities will be used to enhance and / or demonstrate theoretical concepts where possible.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

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

1. ***Define metals, their properties and how they are made.***

Potential Elements of the Performance:

- Review the iron making and steelmaking processes:
 - Blast furnace including coke making
 - Steelmaking, basic oxygen and electric arc furnaces
 - Casting and Continuous casting methods
- Define properties of metals and alloys and how they affect weldability:
 - Corrosion resistance
 - Tensile strength
 - Impact strength
 - Hardness
 - Ductility
- Explain the purpose and effects of heat treatments on steel:
 - Annealing
 - Normalizing
 - Quenching
 - Hardening
 - Tempering
 - Stress relieving

2. ***Discuss the significance of mechanical and physical properties of common metals.***

Potential Elements of the Performance:

- Understand the crystalline structures of carbon steels
- Carbon steel microstructures;
 - I. Ferrite
 - II. Pearlite
 - III. Martensite
 - IV. Austenite

3. ***Identify steel types and classification systems.***

Potential Elements of the Performance:

- Define the characteristics of:
 - Low carbon steel
 - Medium carbon steel
 - High carbon steel
 - Stainless steel
- Classification numbering systems of plain carbon steels:
 - AISI
 - ASTM
 - CSA
- Steel and metal identification methods:
 - Appearance
 - Hardness testing
 - Magnetic testing
 - Spark test
 - Weight test

4. ***Define the fundamentals of distortion control.***

Potential Elements of the Performance:

- Perform correction of weld distortion
- Preheating
- Pre-setting joints
- Effects of weld size, travel speed and multiple pass verses single pass

5. ***Inspection and codes.***

Potential Elements of the Performance:

- Describe inspection and testing methods.
- Describe the requirements of welding codes and standards.
- Explain the function and application of mechanical and non-destructive testing methods.

III. TOPICS:

1. DEFINE METALS AND HOW THEY ARE MADE.
2. DEFINE VARIOUS PROPERTIES OF METALS AND ALLOYS.
3. IDENTIFY STEEL TYPES AND CLASSIFICATION SYSTEMS.
4. DEFINE THE FUNDAMENTALS OF DISTORTION CONTROL.
5. INSPECTION AND CODES.

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

- MTF 134 Booklet Bundle (from Bookstore)
- High Cut (6") Safety Boots (CSA approved)
- Impact Resistant Safety Glasses (CSA approved)

Please Note:

Students are expected to wear safety equipment in the shop; failure to do so will result in denial to work in the shop on that occasion. While working in the shop do not wear rings, exposed jewelry or shorts.

**CELL PHONES MUST NOT BE USED IN THE SHOP OR
CLASSROOM**

V. EVALUATION PROCESS/GRADING SYSTEM:

Three Term Tests	90%	
Heat Treat Project	10%	
Attendance	<u>-1%</u> (per Hour)	(late = 1 hour)
TOTAL	= 100%	

The following semester grades will be assigned to students in other than post-secondary courses:

<u>Grade</u>	<u>Definition</u>	<u>Grade Point Equivalent</u>
A+	90 - 100%	4.00
A	80 - 89%	4.00
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.