



**I. COURSE DESCRIPTION:**

To provide students with a working knowledge of the theory behind the procedures that is used in the making and working with carbon steels, aluminum and its alloys, other construction materials. 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. *Crystalline Structure of Metals***Potential Elements of the Performance:

- Define and describe the term 'crystalline structure'
- Describe crystalline lattice structures at their atomic level
- Describe the crystalline structure of pure metals
- Describe the crystalline structure of alloys
- List common alloying elements for both steel and aluminum
- Describe the various stages of the solidification process of a metal
- Describe the various changes in crystalline structure and grain size of a metal as it solidifies
- Describe how mechanical properties are affected by crystalline structure and grain size

**2. *Mechanical and Physical Properties of Metals***Potential Elements of the Performance:

- Define and describe each of the following mechanical and physical properties and / or terms:
  - Elasticity
  - Yield Point / Strength
  - Tensile ,Compressive, Shear, Bearing strength
  - Conductivity
  - Corrosion
  - Ductility
  - Malleability
  - Hardness
  - Impact Strength
  - Temperature effects
- Describe purpose and effects of the following alloying elements upon the mechanical properties and machining characteristics of a metal

- Carbon
- Sulphur - Phosphorous
- Silicon - Manganese - Copper
- Chromium, Nickel

3. ***Casting of Carbon Steels and Aluminums,  
Steel Manufacturing***

Potential Elements of the Performance:

- Explain the concepts of casting, iron, steel aluminum and other materials
- Define and describe the following terms:
  - Sand casting
  - Centrifugal casting
  - Investment casting
  - Molding
  - Die Casting
  -
- Explain each of the following steel manufacturing processes
  - Hot Working
  - Cold Working
  - Continuous Casting
  - Rolling
  - Forging
  - Extrusion
  -
- Describe the effect on mechanical properties for each of the above processes

4. ***Bolts, Fasteners and Gasket Materials***

Potential Elements of the Performance:

- Identify the types, applications and qualities of fasteners including
  - Unified - American - National - Acme
  - Metric and Pipe thread systems
- Identify and select bolts, nuts, clips, chemical fasteners and adhesives as well as their potential use and application
- Identify and describe typical uses for such materials as
  - rubber
  - plastic
  - nylon
- Describe methods of securing machinery and components using bolts, anchors, fasteners, grouting and epoxy resins

**III. TOPICS:**

1. Crystalline Structure of Metals
2. Mechanical and physical Properties of Metals
3. Casting of carbon steel and aluminum/ Steel Manufacturing processes
4. Bolts, Fasteners and Gasket Materials

**IV. REQUIRED RESOURCES/TEXTS/MATERIALS:**

Text ----- Practical Metallurgy and Materials of Industry  
 John F. Neely/ Thomas J. Bertone  
 Sixth Edition

Impact Resistant Safety Glasses ( CSA Approved )  
 High Cut ( 8 inch ) Work Boots ( CSA Approved )  
 Welding Gloves ( CSA Approved )

**V. EVALUATION PROCESS/GRADING SYSTEM:**

**Three Term Tests 70%**  
**Final test 20%**  
**Assignments 10%**  
**= 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%	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.

**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.