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SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ON

COURSE OUTLINE

COURSE TITLE: METALLURGY

CODE NO: MET 112-2 SEMESTER: FALL 90

PROGRAM: MACHINE SHOP

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DATE: 1990-06-19 PREVIOUS OUTLINE DATED: 1989-05-10

APPROVED:

Dean, School of Technical Trades

Date

COURSE NAME: METALLURGY

CODE NO. MET 112-2

TOTAL CREDIT HOURS: 30

PREREQUISITE(S):

Students must be able to read, write and comprehend at a grade 10 level.

I. PHILOSOPHY/GOALS:

To provide students with a basic understanding of the major groups of metals as well as their properties and potential for use. Ultimately, the intent is to direct students towards applying the course material in the solution of work related (metallurgical) problems.

II. STUDENT PERFORMANCE OBJECTIVES:

Upon successful completion of this course the student will:

1. Understand the difference between ferrous and non-ferrous metals.
2. Identify metals by means of name, chemistry and designation.
3. Understand basic mechanical properties.
4. Understand basic heat treatment techniques.

III. TOPICS TO BE COVERED:

1. Course Introduction and Orientation
2. Identification, Structure and Use of Metals
3. Surface Treatments of Ferrous Metals
4. Heat Treatments VS Mechanical Properties
5. Non-Ferrous Metals

IV. LEARNING ACTIVITIES REQUIRED RESOURCES

<u>Topic</u>	<u>No. Periods</u>	<u>General Topic Description</u>	<u>Resources</u>
	1	<p>INTRODUCTION AND ORIENTATION</p> <p>Identify and describe the METU2-2 course outline with respect to the following significant areas:</p> <ul style="list-style-type: none"> i) philosophy and goals ii) student performance objectives iii) course topics iv) marking system and evaluation methods v) required student resources vi) course guidelines and attendance requirements <p>THE MAJOR METALS - Their Use and Structure</p> <p>2.1 Explain the difference between metals and non-metals.</p> <p>2.2 Explain/describe alloys and the result of alloying</p> <p>2.3 State the difference between ferrous and non-ferrous metals.</p> <p>2.4 List 5 ferrous metals, their general properties and typical uses.</p> <p>2.5 List 3 non-ferrous metals, their general properties and typical uses.</p> <p>2.6 Define/explain the crystalline structure of solids</p> <p>2.7 Briefly describe/explain the strength of a perfect crystal.</p> <p>2.8 Briefly describe/explain the theory of dislocations.</p> <p>2.9 Identify cast irons, cast steels, plain carbon steels, low alloy steels, stainless steels and tool steels according to their:</p> <ul style="list-style-type: none"> i) approximate carbon content ii) significant alloys iii) selected mechanical properties 	<p>Handouts</p> <p>WIC Module P.2-6</p> <p>WIC Module P.8-9</p> <p>Handout</p>

IV.		LEARNING ACTIVITIES	REQUIRED RESOURCES
Topic No.	No. Periods	General Topic Description	Resources
	4	2.10 Explain the SAE steel numbering system 2.11 Identify the general chemical content of a given SAE steel using a combination of the SAE numbers and classification chart 2.12 Identify general types and grades of tool steel according to symbol and use 2.13 Conduct tensile and hardness tests on various metals to summarize this section	M.S.Text P.484-485 M.S.Text P.483-484 Lab Handouts
		THEORY TEST #1 and REVIEW	Handouts
		HEAT TREATMENT VS MECHANICAL PROPERTIES	
		4.1 Develop a general understanding of the iron - iron carbide system (for steels) with respect to: i) lower critical temperature ii) upper critical temperature iii) existing equilibrium structures iv) the need for slow cooling	M.S.Text P.488 & Handout
		4.2 List the three requirements necessary to successfully harden steels 4.3 Explain the formation of martensite 4.4 State the theory that explains why martensite is so hard.	Handout & Notes
	15	4.5 Identify and select the proper temperature ranges for the following heat treating operations: i) anneal ii) normalize iii) harden iv) temper	M.S.Text P.491

IV. LEARNING ACTIVITIES REQUIRED RESOURCES

Topic No.	No. Periods	General Topic Description	Resources
		6.6 State the initial carbon content of steels used in the flame and induction hardening processes. 6.7 Describe the effects of flame and induction hardening on: i) the final carbon content of the steels ii) the final microstructure and hardness of the steels	
7		NON-FERROUS METALS:	
	.5	7.1 Develop an understanding of how a non-ferrous metal can be made stronger through alloying.	WIC Module P.64-65
		7.2 Develop an understanding of how alloyed (non-ferrous) metals can be made even stronger by means of precipitation hardening.	WIC Module P.66
	2	7.3 Develop a general understanding of the aluminum-copper system with respect to: i) the aluminum rich end ii) the temperature zone for solution treating iii) the temperature zone for aging and artificial aging	
	.5	7.4 List the three requirements necessary to harden aluminum copper alloys.	
	.5	7.5 Describe or explain the following terms: i) solution treat ii) aging iii) artificial aging	
8	2	THEORY TEST #3 AND REVIEW	

V. EVALUATION METHODS: (INCLUDES ASSIGNMENTS. ATTENDANCE REQUIREMENTS ETC.)

General Assessment

A+	= 90-100%
A	= 80 - 89%
B	= 70 - 79%
C	= 60 - 69%
F	= 0 - 59 %

Final Mark: *

Theory Test #1
Theory Test #2
Theory Test #3
** Attendance

TOTAL 100%

VI. REQUIRED STUDENT RESOURCES

"Technology of Machine Tools" (Section 19)
3rd Edition, McGraw-Hill, Ryerson

Module: Fundamentals of Welding Metallurgy
Sault College and Welding Institute of Canada

VII. ADDITIONAL RESOURCE MATERIALS AVAILABLE IN THE COLLEGE LIBRARY BOOK SECTION:

N/A

VIIISPECIAL NOTES

* Student evaluations concerning the 'Final Mark' are further affected by the conditions set forth in the printed handout 'Guidelines for Metallurgy'. Be sure to obtain a copy from your instructor.

Special guidelines for attendance are included in the above paper.