

**STATE UNIVERSITY OF NEW YORK  
COLLEGE OF TECHNOLOGY  
CANTON, NEW YORK**



**COURSE OUTLINE**

**CONS 220 / MECH 220 – ENGINEERING MATERIALS**

**Prepared By: Daniel J. Miller  
Revised By: Cullen L. Haskins (5/11/2015)**

**CANINO SCHOOL OF ENGINEERING TECHNOLOGY  
ENGINEERING TECHNOLOGY DEPARTMENT  
May 2015**

- A. **TITLE:** Engineering Materials
- B. **COURSE NUMBER:** CONS 220 – OR – MECH 220
- C. **CREDIT HOURS:** 3
- D. **WRITING INTENSIVE COURSE:** Yes

This is a designated writing intensive course for the 2 year and 4 year Mechanical Engineering Technology and 4 year Civil Engineering Technology programs.

- E. **COURSE LENGTH:** 15 weeks
- F. **SEMESTER(S) OFFERED:** Spring
- G. **HOURS OF LECTURE, LABORATORY, RECITATION, TUTORIAL, ACTIVITY:**

2 – 1 hour lectures / recitation, 1- 3 hour lab per week

- H. **CATALOG DESCRIPTION:**

A study of the wide spectrum of materials used in manufacturing of discrete parts and machines. Materials structure, characteristics, mechanical properties and applications will be stressed for ferrous and non-ferrous metals, plastics, and composites. Two hours lecture, three hours laboratory per week.

- I. **PRE-REQUISITES/CO-REQUISITES:** MATH123, PHYS 121, or permission of instructor
- J. **GOALS (STUDENT LEARNING OUTCOMES):**  
By the end of this course, the student will be able to:

<i>Course Objective</i>	<i>Institutional SLO</i>
<b>a. apply standard testing procedures to measure, collect and interpret laboratory data for material testing in a team environment;</b>	<b>1. Communication Skills 2. Critical Thinking Skills 3. Professional Competence 4. Inter/Intrapersonal Skills</b>
<b>b. determine and identify the mechanical properties of material;</b>	<b>3. Professional Competence</b>
<b>c. identify material property-processing interactions related to heat treatment, cold working, and hot forming;</b>	<b>2. Critical Thinking Skills 3. Professional Competence</b>
<b>d. select the best material (metal, polymer, ceramics or composite) for a particular application;</b>	<b>2. Critical Thinking Skills 3. Professional Competence</b>
<b>e. appraise materials in terms of degradation, oxidation, corrosion, and failure; and</b>	<b>2. Critical Thinking Skills 3. Professional Competence</b>
<b>f. write laboratory reports that are clear, well organized, and professionally accepted.</b>	<b>1. Communication Skills 2. Critical Thinking Skills 3. Professional Competence</b>

**K. TEXTS:** Callister, William D. *Fundamentals of Materials Science and Engineering: An Integrated Approach*. 4th ed. Hoboken, NJ: John Wiley & Sons, 2012. Print. ISBN-10: 9781118061602

**L. REFERENCES:**

Tool and Manufacturing Engineers Handbook, Society of Manufacturing Engineers

Heat Treating, Metals Handbook, Vol. 4 ASM International

Introduction to Physical Metallurgy, Avner, McGraw-Hill General Dynamics series on non-destructive testing.

American Welding Society series on nondestructive testing, Van Vlack.

Elements of Materials Science and Engineering, Addison-Wesley

**M. EQUIPMENT:** Materials test lab (Nevaldine South 110), Computer Lab

**N. GRADING METHOD:** A-F

**N. MEASUREMENT CRITERIA/METHODS:**

- Homework
- Quizzes
- Exams
- Lab Activities with written reports

**P. DETAILED COURSE OUTLINE:** (must use the outline format listed below)

I. Introduction to Materials in Manufacturing

II. The Nature and Structure of Materials

A. Atomic Structure

B. Atomic Bonding

C. Atomic Arrangement

III. Mechanical Properties of Materials

A. Mechanical

B. Strain Hardening and Annealing

IV. Structure of Materials

A. Ferrous Metals and Alloys

B. Nonferrous Metals and Alloys

C. Polymers

D. Composites

E. Wood

V. Degradation, Oxidation and Corrosion of Materials

A. Corrosion

B. Oxidation

C. Wear

**Q. LABORATORY OUTLINE:**

I. Lab Orientation and Lab Report Template Preparation

II. Unit Cell and Lattice Structures

- III. Mechanical Properties and Selection: Polymers and Metals
- IV. Tensile Test of Steel and Aluminum
- V. Tensile Test of Cast Iron and Plastic
- VI. Shear Testing of Steel, Brass, and Aluminum
- VII. Effects of Cold Working
- VIII. Impact Testing of Steel
- IX. Fatigue Calculations
- X. Jominy End Quench (Hardenability) of 1018, 1095, and 4140 Steels
- XI. Metallography
- XII. Heat Treatment and Tensile Test of Tool Steel