

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



**MASTER SYLLABUS**

**COURSE NUMBER – COURSE NAME  
MECH 220 – ENGINEERING MATERIALS**

**Created by: Cullen Haskins**

**Updated by:**

**Canino School of Engineering Technology**

**Department: MECHANICAL ENGINEERING TECHNOLOGY**

**Semester/Year: FALL 2018**

- A. **TITLE:** ENGINEERING MATERIALS
- B. **COURSE NUMBER:** MECH 220
- C. **CREDIT HOURS:** (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity)

# Credit Hours: 3  
# Lecture Hours: 2 per week  
# Lab Hours: (1) three-hour lab per week  
Other: per week

Course Length: 15 Weeks

- D. **WRITING INTENSIVE COURSE:** Yes  No
- E. **GER CATEGORY:** None:  Yes: GER  
*If course satisfies more than one:* GER
- F. **SEMESTER(S) OFFERED:** Fall  Spring  Fall & Spring

G. **COURSE 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.

- H. **PRE-REQUISITES:** None  Yes  If yes, list below:

MATH 123, PHYS 121, or permission of instructor

**CO-REQUISITES:** None  Yes  If yes, list below:

**I. STUDENT LEARNING OUTCOMES: (see key below)**

By the end of this course, the student will be able to:

| <b><u>Course Student Learning Outcome</u></b><br><b><u>[SLO]</u></b>   | <b><u>Program Student Learning Outcome</u></b><br><b><u>[PSLO]</u></b> | <b><u>GER</u></b><br><i>[If Applicable]</i> | <b><u>ISLO &amp; SUBSETS</u></b>                                 |  |
|--|--|---|--|--|
| A. Apply standard testing procedures to measure, collect, and interpret laboratory data for material testing in a team environment | PENDING ABET OUTCOME UPDATE  |   | 1-Comm Skills<br>5-Ind, Prof, Disc, Know Skills<br>4-Soc Respons | O<br>Subsets<br>T<br>Subsets             |
| B. Determine and identify the mechanical properties of material  |  |   | 5-Ind, Prof, Disc, Know Skills<br>ISLO<br>ISLO                   | Subsets<br>Subsets<br>Subsets<br>Subsets |
| C. Identify material property-processing interactions related to heat treatment, cold working, and hot forming                     |  |   | 2-Crit Think<br>5-Ind, Prof, Disc, Know Skills<br>ISLO           | PS<br>Subsets<br>Subsets<br>Subsets      |
| D. Select the best material (metal, polymer, ceramics, or composite) for a particular application                                  |  |   | 2-Crit Think<br>5-Ind, Prof, Disc, Know Skills<br>ISLO           | PS<br>Subsets<br>Subsets<br>Subsets      |
| E. Appraise materials in terms of degradation, oxidation, corrosion, and failure   |  |   | 2-Crit Think<br>5-Ind, Prof, Disc, Know Skills<br>ISLO           | PS<br>Subsets<br>Subsets<br>Subsets      |
| F. Write laboratory reports that are clear, well organized, and professionally accepted  |  |   | 1-Comm Skills<br>2-Crit Think<br>5-Ind, Prof, Disc, Know Skills  | W<br>CA<br>Subsets<br>Subsets            |

|  |  |  |                      |  |
|--|--|--|----------------------|--|
|  |  |  | ISLO<br>ISLO<br>ISLO | Subsets<br>Subsets<br>Subsets<br>Subsets |
|  |  |  | ISLO<br>ISLO<br>ISLO | Subsets<br>Subsets<br>Subsets<br>Subsets |
|  |  |  | ISLO<br>ISLO<br>ISLO | Subsets<br>Subsets<br>Subsets<br>Subsets |
|  |  |  | ISLO<br>ISLO<br>ISLO | Subsets<br>Subsets<br>Subsets<br>Subsets |

| <b>KEY</b>    | <b><u>Institutional Student Learning Outcomes [ISLO 1 – 5]</u></b>  |
|---------------|---|
| <b>ISLO #</b> | <b>ISLO &amp; Subsets</b>   |
| <b>1</b>      | <b>Communication Skills</b><br>Oral [O], Written [W]  |
| <b>2</b>      | <b>Critical Thinking</b><br><i>Critical Analysis [CA] , Inquiry &amp; Analysis [IA] , Problem Solving [PS]</i>                  |
| <b>3</b>      | <b>Foundational Skills</b><br><i>Information Management [IM], Quantitative Lit./Reasoning [QTR]</i>                             |
| <b>4</b>      | <b>Social Responsibility</b><br><i>Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]</i> |
| <b>5</b>      | <b>Industry, Professional, Discipline Specific Knowledge and Skills</b>   |

\*Include program objectives if applicable. Please consult with Program Coordinator

J. **APPLIED LEARNING COMPONENT:** Yes  No

If YES, select one or more of the following categories:

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Classroom/Lab | <input type="checkbox"/> Civic Engagement              |
| <input type="checkbox"/> Internship               | <input type="checkbox"/> Creative Works/Senior Project |
| <input type="checkbox"/> Clinical Placement       | <input type="checkbox"/> Research                      |
| <input type="checkbox"/> Practicum                | <input type="checkbox"/> Entrepreneurship              |
| <input type="checkbox"/> Service Learning         | (program, class, project)                              |
| <input type="checkbox"/> Community Service        |  |

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 nondestructive testing.

American Welding Society series on nondestructive testing, Van Vlack.

Elements of Materials Science and Engineering, Addison-Wesley

M. **EQUIPMENT:** None  Needed: Materials Testing Lab (Nevaldine South 110)

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

O. **SUGGESTED MEASUREMENT CRITERIA/METHODS:**

Homework, Quizzes, Exams, Written Lab Reports

P. **DETAILED COURSE OUTLINE:**

**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: None  Yes**

**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. Anodization**