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:

<table>
<thead>
<tr>
<th>Course Student Learning Outcome [SLO]</th>
<th>Program Student Learning Outcome [PSLO]</th>
<th>GER [If Applicable]</th>
<th>ISLO &amp; SUBSETS</th>
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</thead>
<tbody>
<tr>
<td>A. Apply standard testing procedures to measure, collect, and interpret laboratory data for material testing in a team environment</td>
<td>PENDING ABET OUTCOME UPDATE</td>
<td>1-Comm Skills 5-Ind, Prof, Disc, Know Skills 4-Soc Respons</td>
<td>O Subsets T Subsets</td>
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<td>B. Determine and identify the mechanical properties of material</td>
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<td>5-Ind, Prof, Disc, Know Skills ISLO ISLO</td>
<td>Subsets Subsets Subsets Subsets</td>
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<td>C. Identify material property-processing interactions related to heat treatment, cold working, and hot forming</td>
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<td>2-Crit Think 5-Ind, Prof, Disc, Know Skills ISLO</td>
<td>PS Subsets Subsets Subsets Subsets</td>
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<td>D. Select the best material (metal, polymer, ceramics, or composite) for a particular application</td>
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<td>2-Crit Think 5-Ind, Prof, Disc, Know Skills ISLO</td>
<td>PS Subsets Subsets Subsets Subsets</td>
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<td>E. Appraise materials in terms of degradation, oxidation, corrosion, and failure</td>
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<td>2-Crit Think 5-Ind, Prof, Disc, Know Skills ISLO</td>
<td>PS Subsets Subsets Subsets Subsets</td>
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<td>F. Write laboratory reports that are clear, well organized, and professionally accepted</td>
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<td>1-Comm Skills 2-Crit Think 5-Ind, Prof, Disc, Know Skills</td>
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<td>KEY</td>
<td>Institutional Student Learning Outcomes [ISLO 1 – 5]</td>
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<td>ISLO &amp; Subsets</td>
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<td>1</td>
<td>Communication Skills</td>
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<td>Oral [O], Written [W]</td>
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<td>2</td>
<td>Critical Thinking</td>
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<td>Critical Analysis [CA], Inquiry &amp; Analysis [IA], Problem Solving [PS]</td>
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<td>Foundational Skills</td>
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<td>Information Management [IM], Quantitative Lit./Reasoning [QTR]</td>
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<td>Social Responsibility</td>
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<td>Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]</td>
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<td>5</td>
<td>Industry, Professional, Discipline Specific Knowledge and Skills</td>
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*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:

- ☒ Classroom/Lab
- ☐ Internship
- ☐ Clinical Placement
- ☐ Practicum
- ☐ Service Learning
- ☐ Community Service
- ☐ Civic Engagement
- ☐ Creative Works/Senior Project
- ☐ Research
- ☐ Entrepreneurship (program, class, project)

K. **TEXTS:**


L. **REFERENCES:**

Tool and Manufacturing Engineers Handbook, Society of Manufacturing Engineers


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