## MACH 161 Course Outline as of Fall 2021

# **CATALOG INFORMATION**

Dept and Nbr: MACH 161 Title: METALLURGY Full Title: Metallurgy Last Reviewed: 12/12/2023

Units		<b>Course Hours per Week</b>		Nbr of Weeks	<b>Course Hours Total</b>	
Maximum	3.00	Lecture Scheduled	2.00	17.5	Lecture Scheduled	35.00
Minimum	3.00	Lab Scheduled	3.00	6	Lab Scheduled	52.50
		Contact DHR	0		Contact DHR	0
		Contact Total	5.00		Contact Total	87.50
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 70.00

Total Student Learning Hours: 157.50

Title 5 Category:	AA Degree Applicable
Grading:	Grade Only
Repeatability:	00 - Two Repeats if Grade was D, F, NC, or NP
Also Listed As:	
Formerly:	MACH 61.1

### **Catalog Description:**

Study of metals including alloying, heat treating, testing and applications in industry.

## **Prerequisites/Corequisites:**

### **Recommended Preparation:**

Eligibility for ENGL 100 or ESL 100 and Course Completion or Concurrent Enrollment in IED 190

## **Limits on Enrollment:**

## **Schedule of Classes Information:**

Description: Study of metals including alloying, heat treating, testing and applications in industry. (Grade Only) Prerequisites/Corequisites: Recommended: Eligibility for ENGL 100 or ESL 100 and Course Completion or Concurrent Enrollment in IED 190 Limits on Enrollment: Transfer Credit:

# **ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:**

AS Degree: CSU GE:	Area Transfer Area	Effective: Effective:	Inactive: Inactive:
<b>IGETC:</b>	Transfer Area	Effective:	Inactive:
CSU Transfer	: Effective:	Inactive:	
UC Transfer:	Effective:	Inactive:	

## CID:

## **Certificate/Major Applicable:**

Both Certificate and Major Applicable

# **COURSE CONTENT**

## **Student Learning Outcomes:**

At the conclusion of this course, the student should be able to:

- 1. Describe the basic classification of metals, crystal structures and various material properties.
- 2. Explain the manufacturing, identification, phase diagram, heat treatment processes and deformation of iron and iron alloys.
- 3. Perform basic lab experiments demonstrating sample preparation and examination methods.

## **Objectives:**

At the conclusion of this course, the student should be able to:

- 1. Describe the basic properties of all metals.
- 2. Describe the process of mining, extraction and refining of ores to metals.
- 3. Identify metals and alloys using the periodical table of elements or tables of alloys numbering systems.
- 4. Explain various crystal structures.
- 5. Explain heat treatment processes and surface hardening techniques pertinent to steel alloys.
- 6. Use handout materials, text and library materials to do research on metallurgical alloys.
- 7. Perform basic lab experiments including: plotting data, dimensional measurements, heat treatments, tensile loading and metallurgical sample preparation and examination methods.

## **Topics and Scope:**

- I. Introduction to Metallurgy
- II. History of Elements
- III. Iron and Steel Refining
- IV. Identifying Ferrous and Non-Ferrous Metals
- V. Crystal Structure Systems
- VI. Tensile Test
- VII. Heat Treatment Techniques
- VIII. Quenching Medias
- IX. Hardness Testers
- X. Physical and Chemical Metallurgy

- XI. Grain Structure and Patterns
- XII. Iron and Steel Systems
  - A. A.I.S.I. [American Iron and Steel Institute]
  - B. S.A.E. [Society of Automotive Engineers]
  - C. U.S.S. [United States Standard]
  - D. A.W.S. [American Welding Society]
- XIII. Density Measurements
- XIV. Surface Hardening Methods

All topics are covered in both the lecture and lab parts of the course.

## Assignment:

Lecture-Related Assignments:

- 1. Reading (approximately 10 15 pages per week)
- 2. Complete assignments in each chapter
- 3. Quizzes (7 15), midterm and final exam
- 4. A semester group (or individual) project followed by an oral presentation to the class; the semester project can be substituted with a mid-term paper, as per instructions by instructor, consisting of library research

Lab-Related Assignments:

1. Laboratory assignments to be completed during the lab sessions (7 - 10)

## Methods of Evaluation/Basis of Grade:

**Writing:** Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

Semester project

**Problem Solving:** Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Lab assignments, chapter assignments

**Skill Demonstrations:** All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

None

**Exams:** All forms of formal testing, other than skill performance exams.

Quizzes, midterm and final exam

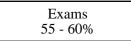
**Other:** Includes any assessment tools that do not logically fit into the above categories.

Problem solving	
15 - 25%	

Writing

0 - 25%

Skill Demonstrations 0 - 0%



Other Category 0 - 25%

**Representative Textbooks and Materials:** Metallurgy Fundamental. 5th ed. Brandt, Daniel and Warner, J.C. Goodheart-Wilcox Company, Inc. 2009 (classic) Instructor prepared materials