MACH 161 Course Outline as of Fall 2020

CATALOG INFORMATION

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

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
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:

Repeatability: Two Repeats if Grade was D, F, NC, or NP

ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

AS Degree:	**Area**	Effective:	Inactive:
CSU GE:	**Transfer Area**	Effective:	Inactive:
IGETC:	**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:
Upon completion of this course, students will 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	Writing 0 - 25%

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

Lab assignments, chapter assignments	Problem solving 15 - 25%

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

None	Skill Demonstrations 0 - 0%

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

Quizzes, midterm and final exam	Exams 55 - 60%

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

Oral presentation	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