

MTLGY150 : Principles Of Metallurgy And Heat Treating

General Information

Author:	<ul style="list-style-type: none">Curtis G Potter
Course Code (CB01) :	MTLGY150
Course Title (CB02) :	Principles Of Metallurgy And Heat Treating
Department:	MTLGY
Proposal Start:	Fall 2024
TOP Code (CB03) :	(0956.50) Welding Technology
CIP Code:	(48.0508) Welding Technology/Welder.
SAM Code (CB09) :	Clearly Occupational
Distance Education Approved:	No
Will this course be taught asynchronously?:	No
Course Control Number (CB00) :	CCC000626468
Curriculum Committee Approval Date:	05/22/2024
Board of Trustees Approval Date:	07/16/2024
Last Cyclical Review Date:	05/22/2024
Course Description and Course Note:	MTLGY 150 introduces basic metallurgy as applied to welding, emphasizing common heat treatment procedures, welding enhancement procedures, and thermal control of stress and strain in relation to ferrous and non-ferrous metals. Applications of destructive and nondestructive testing and their role in quality assurance are covered.
Justification:	Mandatory Revision
Academic Career:	<ul style="list-style-type: none">Credit
Mode of Delivery:	
Author:	Curtis G Potter
Course Family:	

Academic Senate Discipline

Primary Discipline:	<ul style="list-style-type: none">Mining and Metallurgy (Oil field operations)
Alternate Discipline:	<ul style="list-style-type: none">Welding
Alternate Discipline:	No value

Course Development

Basic Skill Status (CB08)

Course is not a basic skills course.

Allow Students to Gain Credit by Exam/Challenge

Course Special Class Status (CB13)

Course is not a special class.

Pre-Collegiate Level (CB21)

Not applicable.

Grading Basis

- Grade with Pass / No-Pass Option

Course Support Course Status (CB26)

Course is not a support course

General Education and C-ID

General Education Status (CB25)

Not Applicable

Transferability

Transferable to CSU only

Transferability Status

Approved

Units and Hours

Summary

Minimum Credit Units (CB07) 3

Maximum Credit Units (CB06) 3

Total Course In-Class (Contact) Hours 54

Total Course Out-of-Class Hours 108

Total Student Learning Hours 162

Credit / Non-Credit Options

Course Type (CB04)

Credit - Degree Applicable

Noncredit Course Category (CB22)

Credit Course.

Noncredit Special Characteristics

No Value

Course Classification Code (CB11)

Credit Course.

Variable Credit Course

Funding Agency Category (CB23)

Not Applicable.

Cooperative Work Experience

Education Status (CB10)

Weekly Student Hours

	In Class	Out of Class
Lecture Hours	3	6
Laboratory Hours	0	0
Studio Hours	0	0

Course Student Hours

Course Duration (Weeks)	18
Hours per unit divisor	0
Course In-Class (Contact) Hours	
Lecture	54
Laboratory	0
Studio	0

Total 54

Course Out-of-Class Hours

Lecture 108

Laboratory 0

Studio 0

Total 108

Time Commitment Notes for Students

No value

Units and Hours - Weekly Specialty Hours

Activity Name	Type	In Class	Out of Class
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No Value	No Value	No Value	No Value
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Pre-requisites, Co-requisites, Anti-requisites and Advisories

No Value

Entry Standards

Entry Standards

Course Limitations

Cross Listed or Equivalent Course

Specifications

Methods of Instruction

Methods of Instruction	Lecture
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Methods of Instruction	Discussion
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Methods of Instruction	Multimedia			
Methods of Instruction	Collaborative Learning			
Methods of Instruction	Demonstrations			
Methods of Instruction	Field Activities (Trips)			
Methods of Instruction	Guest Speakers			
Methods of Instruction	Presentations			
Out of Class Assignments <ul style="list-style-type: none"> • Group project (e.g. research and write a description of the properties and uses of an assigned metal) • Written assignments (e.g. describe the effects heat treating processes on assigned metals) 				
Methods of Evaluation	Rationale			
Exam/Quiz/Test	Monthly quizzes			
Exam/Quiz/Test	Chapter workbook assignments			
Exam/Quiz/Test	Final exam			
Textbook Rationale No Value				
Textbooks				
Author	Title	Publisher	Date	ISBN
Brandt, Daniel A.	Metallurgy Fundamentals	Goodheart-Willcox	2025	979-8-88817-442-5
Other Instructional Materials (i.e. OER, handouts) No Value				
Materials Fee No value				

Learning Outcomes and Objectives

Course Objectives

Compile and maintain an extensive metallurgical reference guide.

Evaluate for correct procedure for material identification, correct testing method, and physical, chemical, and mechanical properties of the material.

Perform standard testing procedures on metals using the proper equipment required for tensile, spark, and hardness testing.

Use heat treatment of various metals and alloys in manufacturing related technologies.

Describe the branches of material science including specific characteristics.

Define the five types of applications of mechanical force.

Explain phase change reactions from an iron-carbon phase diagram and its importance for carbon steels.

Draw crystalline structure diagrams of metals and measure grain size development.

Compare common types of stainless steels and their properties.

Explain how to use destructive tests to locate discontinuities in metals.

Contrast common welding processes for ferrous and non-ferrous metals.

SLOs

Describe how the properties of metals and materials are used to select materials and processes for various welding and manufacturing applications. Expected Outcome Performance: 70.0

ILOs Communicate clearly, ethically, and creatively; listen actively and engage respectfully with others; consider situational, cultural, and personal contexts within or across multiple modes of communication.

Core

ILOs

Demonstrate depth of knowledge in a course, discipline, or vocation by applying practical knowledge, skills, abilities, theories, or methodologies to solve unique problems.

Apply knowledge of metallurgy to the application of heat treating various metals in the discipline of welding.

Expected Outcome Performance: 70.0

ILOs Analyze and solve problems using critical, logical, and creative thinking; ask questions, pursue a line of inquiry, and derive conclusions;
Core cultivate creativity that leads to innovative ideas.

ILOs

Demonstrate depth of knowledge in a course, discipline, or vocation by applying practical knowledge, skills, abilities, theories, or methodologies to solve unique problems.

Describe the physical, chemical, and mechanical properties of various metals in welding applications.

Expected Outcome Performance: 70.0

ILOs Communicate clearly, ethically, and creatively; listen actively and engage respectfully with others; consider situational, cultural, and personal
Core contexts within or across multiple modes of communication.

ILOs

Demonstrate depth of knowledge in a course, discipline, or vocation by applying practical knowledge, skills, abilities, theories, or methodologies to solve unique problems.

Additional SLO Information

Does this proposal include revisions that might improve student attainment of course learning outcomes?

No

Is this proposal submitted in response to learning outcomes assessment data?

No

If yes was selected in either of the above questions for learning outcomes, explain and attach evidence of discussions about learning outcomes.

No Value

SLO Evidence

No Value

Course Content

Lecture Content

Introduction the Subject of Metallurgy (4.5 hours)

- Production of Iron and Steel
- Refining
- Shaping
- Forming

Physical Metallurgy (12 hours)

- Pure metals
- Crystallization
- Dendritic growth
- Deformation
- Work hardening

Mechanical Properties of Metals (6 hours)

- Carbon steels
- Testing of materials
- Metallography
- Grain size
- Material certification
- Analysis and material standards

Theory of Alloys (6 hours)

- Eutectic alloys
- Properties of alloys
- Iron-carbon diagram
- Stainless steel
- Non-ferrous alloys

Heat Treatment of Steel (12 hours)

- Processes of heat treating
- Hardening processes
- Effects of carbon
- Heat treating furnaces, atmospheres
- Surface treatments

Alloys and Special Steels (7 hours)

- Influences of elements
- Classification of steels Cast irons

Welding Metallurgy (1 hour)

- Arc, gas-shielded, flux-cores, oxy-acetylene, and oxy-gas processes
- Effects of welding on metal structure

Powder Metallurgy (1.5 hours)

- Methods and applications

Production of Nonferrous Metals (4 hours)

- Light metals and alloys
- Copper and alloys
- Bearing metals.

Total hours: 54

Additional Information

Is this course proposed for GCC Major or General Education Graduation requirement? If yes, indicate which requirement in the two areas provided below.

No

GCC Major Requirements

No Value

GCC General Education Graduation Requirements

No Value

Repeatability

Not Repeatable

Justification (if repeatable was chosen above)

No Value

Resources

Did you contact your departmental library liaison?

Yes

If yes, who is your departmental library liaison?

Adina Lerner (Technology & Aviation, Visual & Performing Arts)

Did you contact the DEIA liaison?

Yes

Were there any DEIA changes made to this outline?

No

If yes, in what areas were these changes made:

No Value

Will any additional resources be needed for this course? (Click all that apply)

- No

If additional resources are needed, add a brief description and cost in the box provided.

No Value