Glendale College

Course Outline of Record Report

Course ID 010352

Revision - April 2025

ENGR141 : Materials Science and Engineering Laboratory

General Information

Author:	• Christopher Herwerth
Course Code (CB01) :	ENGR141
Course Title (CB02) :	Materials Science and Engineering Laboratory
Department:	ENGR
Proposal Start:	Spring 2026
TOP Code (CB03) :	(0901.00) Engineering, General (requires Calculus) (Transfer)
CIP Code:	(14.0102) Pre-Engineering.
SAM Code (CB09) :	E - Non-Occupational
Distance Education Approved:	No
Will this course be taught asynchronously?:	No
Course Control Number (CB00) :	CCC000598540
Curriculum Committee Approval Date:	04/23/2025
Board of Trustees Approval Date:	06/17/2025
Last Cyclical Review Date:	04/23/2025
Course Description and Course Note:	ENGR 141 introduces the different types of materials used in engineering design, examining the relationships between properties and structures. Students use experimental equipment and laboratory report writing activities to directly observe and analyze the characteristics of engineering materials that relate to the lecture course ENGR 140 (Materials Science and Engineering).
Justification:	Mandatory Revision
Academic Career:	• Credit
Mode of Delivery:	• In-Person • Hybrid
Author:	No value
Course Family:	No value

Academic Senate Discipline

Primary Discipline:	• Engineering
Alternate Discipline:	No value
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 both UC and CSU

Transferability Status

Approved

C-ID	Area	Status	Approval Date	Comparable Course
ENGR	Engineering	Approved	09/03/2019	ENGR 140 L - Materials Science and Engineering Lab

Units and Hours

Summary

Minimum Credit Units (CB07)	1
Maximum Credit Units (CB06)	1
Total Course In-Class (Contact) Hours	54
Total Course Out-of-Class Hours	0
Total Student Learning Hours	54

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

Course Student Hours

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

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

Time Commitment Notes for Students

No value

Units and Hours - Weekly Specialty Hours

Activity Name	Type	In Class	Out of Class
No Value	No Value	No Value	No Value

Prerequisites, Corequisites, Recommended Corequisites, and Recommended Preparation

Prerequisite

PHY101 - Physics for Scientists and Engineers: A

Objectives

- Calculate the work performed by forces.
- Collect quantitative data from observations of physical phenomena.
- Organize data in tables, and present data using graphs.
- Use computers to perform calculations and to make graphs.

AND

Prerequisite

CHEM101 - General Chemistry A

Objectives

- Describe chemical processes using chemical equations.
- Use quantum theory to predict electronic structures of the atom.
- Analyze the properties of elements and identify trends for the classification of the elements into groups.
- Apply bonding theories to describe the nature of ions and molecules.
- Demonstrate the proper use of laboratory equipment and the ability to handle chemicals safely.

AND

Co-Requisite

ENGR140 - Materials Science and Engineering

Entry Standards

Entry Standards	Description
No value	No value

Course Limitations

Cross Listed or Equivalent Course	Description
No value	No value

Specifications

Methods of Instruction

Methods of Instruction	Laboratory
Methods of Instruction	Discussion
Methods of Instruction	Collaborative Learning

Out of Class Assignments

- Calculations (e.g., calculate expected stress and strain of a beam under a given load)
- Lab report (e.g., technical lab report on a tensile test of ductile steel)
- Individual project (e.g., graphing and curve fitting of a stress-strain curve)
- Group project (e.g., investigation of a material failure for a client)

Methods of Evaluation	Description of Activity/Interaction
Exam/Quiz/Test	Quiz
Exam/Quiz/Test	

Laboratory practical examination (e.g., demonstration of proficiency with a materials compression testing machine)

Textbook Rationale

These are most recent versions of the book and are high quality content

Textbooks

Author	Title	Publisher	Date	ISBN
William Callister	Materials Science and Engineering: An Introduction	John Wiley and Sons	2018	13 978-1-119-40549-8
Donald Askeland	Essentials of Materials Science and Engineering	CENGAGE	2019	13 9781337385497

Other Instructional Materials (i.e. OER, handouts)

Description	Glendale Community College Materials Science Laboratory Manual
Author	No value
Citation	No value
Online Resource(s)	No value

Learning Outcomes

Course Objectives

Differentiate properties of various materials.

Apply knowledge of materials to engineering design decisions.

Compare the strengths and weaknesses of different types of engineering materials.

Explain the effects of fabrication on properties of materials.

Measure and evaluate material properties and processing treatments using materials science test equipment and methods.

Produce concisely-written industry standard laboratory reports that communicate experimental data.

Collect, analyze and interpret experimental data using professional written formats.

SLOs

Compare material properties using critical thinking skills in the engineering design process. Expected Outcome Performance: 70.0

Estimate the behavior of materials under various loading conditions and make engineering judgments based on industry standards. Expected Outcome Performance: 70.0

Communicate results of materials science tests. Expected Outcome Performance: 70.0

ENGR Civil Engineering	Apply knowledge of mathematics, science and engineering; identify, form and solve engineering problems
ILOs Core 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.
	Demonstrate depth of knowledge in a course, discipline, or vocation by applying practical knowledge, skills, abilities, theories, or methodologies to solve unique problems.
ENGR Engineering Technology - CAD & Design Drafting	Discuss how the design process and design/drawing techniques are used with other engineering processes to create a finished product.
ENGR Engineering Entrepreneurship Skill Award	Learn hands-on skills and problem solving techniques for businesses related to engineering design, installation, manufacturing, testing, technical sales, maintenance, and other such topics in engineering technology.
	Learn the engineering design process and how technical products are made, assembled, and integrated into complex systems.
ENGR Electrical Engineering A.S. Degree Major	demonstrate appropriate technical written, verbal, drawing, and communication skills;
ENGR Computer Engineering AS	demonstrate appropriate technical written, verbal, drawing, and communication skills;
ENGR Mechanical Engineering - A.S. Degree Major	demonstrate appropriate technical written, verbal, drawing, and communication skills;

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

No value

Laboratory/Studio Content

Laboratory Introduction and Safety (3 hours)

- Laboratory equipment
- Laboratory rules and best practices
- Personal Protection Equipment (PPE) and lab safety engagement
- Inclusive peer-to-peer and leadership teamwork for successful experimentation

Measurement Tools (3 hours)

- Lab 1: Measurement and analysis using various tools
    - Ruler
    - Caliper
    - Micrometer
    - Analog vs digital
    - Accuracy and precision

Atomic Structure and Bonding (3 hours)

- Lab 2: Creating physical models of Unit Cells to identify common structures like Body Centered Cell (BCC) and Face Centered Cell (FCC)
    - Crystal structures
    - Crystallography
    - Imperfections in crystals
    - Diffusion

X-Ray Diffraction (3 hours)

- Lab 3: Evaluating atomic crystalline structure using x-ray diffraction
    - Bragg's Law

Mechanical Properties of Materials (6 hours)

- Lab 4: Tensile testing of metallic and polymeric materials
    - Tensile test of steel alloys
    - Tensile test of polymers
    - Elastic and plastic deformation
    - Stress-strain curve
    - Modulus of elasticity
    - Strength, toughness, resilience
    - Mechanical failure

Mechanical Properties of Non-Ferrous Materials (3 hours)

- Lab 5: Tensile test of copper and aluminum

Mechanical Properties Compression and Shear Testing (3 hours)

- Lab 6: Compression test of brittle and ductile materials
    - Compression test of brittle materials
    - Compression test of ductile materials
    - Shear test

Hardness Testing (3 hours)

- Lab 7: Hardness testing
    - Rockwell hardness test
    - Wilson Brinell hardness test

Hysteresis Effects (3 hours)
- Lab 8: Cold working (strain hardening) tensile test of carbon steel

Impact Testing (3 hours)
- Lab 9: Charpy impact test

Metallography (3 hours)
- Lab 10: Photomicrograph analysis of alloys
  - Eutectic examination of alloys
  - Grinding
  - Polishing

Heat Treatment (6 hours)
- Lab 11: Heat treatment of steel
  - Iron-carbon material

Hardenability Heat Treatment (6 hours)
- Lab 12: Hardenability of steel
  - Jominy end quench

Precipitation Heat Treatment (6 hours)
- Lab 13: Precipitation hardening of aluminum
  - Rockwell hardness

Total Hours: 54

Additional Information

Repeatability

Not Repeatable

Justification (if repeatable was chosen above)

No Value

Is it possible this course will have a material fee?

No

I have contacted my library liaison (https://campusguides.glendale.edu/faculty/liaisons):

Yes

What term(s) will this course be offered?

Fall

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

Resources

Did you contact your departmental library liaison?

Yes

If yes, who is your departmental library liason?

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