ENGR M912: BRIDGE TO ENGR M12 - ENGINEERING MATERIALS

Originator
srelle

College
Moorpark College

Discipline (CB01A)
ENGR - Engineering

Course Number (CB01B)
M912

Course Title (CB02)
Bridge to ENGR M12 - Engineering Materials

Banner/Short Title
Bridge to ENGR M12

Credit Type
Noncredit

Start Term
Fall 2020

Catalog Course Description
Prepares students for the prerequisite materials necessary to be successful in ENGR M12. Includes chemistry concepts such as chemical bonds and thermodynamics, physics concepts such as force vectors, and some mathematical concepts such as trigonometric principles, differentiation, integration, vector dot product, and graphing.

Taxonomy of Programs (TOP) Code (CB03)
0924.00 - *Engineering Technology, General (requires Trigonometry)

Course Credit Status (CB04)
N (Noncredit)

Course Transfer Status (CB05) (select one only)
C (Not transferable);

Course Basic Skills Status (CB08)
N - The Course is Not a Basic Skills Course

SAM Priority Code (CB09)
D - Possibly Occupational

Course Cooperative Work Experience Education Status (CB10)
N - Is Not Part of a Cooperative Work Experience Education Program

Course Classification Status (CB11)
K - Other Noncredit Enhanced Funding

Educational Assistance Class Instruction (Approved Special Class) (CB13)
N - The Course is Not an Approved Special Class

Course Prior to Transfer Level (CB21)
Y - Not Applicable

Course Noncredit Category (CB22)
I - Short-Term Vocational

Funding Agency Category (CB23)
Y - Not Applicable (Funding Not Used)

Course Program Status (CB24)
2 - Not Program Applicable

General Education Status (CB25)
Y - Not Applicable

Support Course Status (CB26)
S - Course is a support course

Field trips
Will not be required

Grading method
Pass/No Pass Grading

Alternate grading methods
Student Option- Letter/Pass

Does this course require an instructional materials fee?
No

Repeatable for Credit
Yes
Number of times a student may enroll in this course
Unlimited

Maximum units a student may earn in this course
0

Units and Hours

Carnegie Unit Override
Yes

Total in-Class (full semester or term)
Total Minimum Contact/In-Class Hours (for full semester or term; not weekly)
8.0
Total Maximum Contact/In-Class Hours (for full semester or term; not weekly)
8.0

Total Student Learning

Total Student Learning
Total Minimum Student Learning Hours
8.0
Total Maximum Student Learning Hours
8.0

Student Learning Outcomes (CSLOs)

	Upon satisfactory completion of the course, students will be able to:
1	recognize and explain primary and secondary bonds in metals, ceramics, and polymers.
2	perform mathematical operations such as differentiation, integration, calculating vector magnitudes, dot products, and determining vector directions.
3	recognize the importance of chemical and physics concepts in materials science and engineering.

Course Objectives

	Upon satisfactory completion of the course, students will be able to:
1	explain how chemical bonds are formed.
2	explain the relationship between bond energy and bond force.
3	explain primary and secondary bonds.
4	draw vectors and determine their magnitudes and directions.
5	use appropriate mathematical operations to simplify and manipulate engineering equations.
6	construct and interpret graphs.
7	perform unit analysis.

Course Content

Lecture/Course Content

1. **(40%) - Review of Chemical Concepts**
   a. Electron configurations
   b. Molar mass calculations
   c. Bonding forces and energies
   d. Primary and secondary bonds
   e. Activation energy
   f. Chemical thermodynamics
2. **(20%) - Vectors**
   a. Drawing and determining their magnitude and direction using Pythagorean Theorem and trigonometric functions
   b. Performing dot-product to determine vector projection and the angle between two vectors
   c. Resolving a vector into its components
3. **(20%) - Review of Certain Mathematical Concepts**
   a. Differentiation
   b. Integration
   c. Trigonometric functions
   d. Dot product
4. **(10%) - Unit Analysis**
   a. Conversion factors
   b. Units
   c. Dimensional analysis
5. **(10%) - Creating and Interpreting Graphs**
   a. Linear function
   b. Polynomial function
   c. Exponential function
   d. Power law

Methods of Evaluation

Which of these methods will students use to demonstrate proficiency in the subject matter of this course? (Check all that apply):

Problem solving exercises
Skills demonstrations
Written expression

Methods of Evaluation may include, but are not limited to, the following typical classroom assessment techniques/required assignments (check as many as are deemed appropriate):

Computational homework
Other (specify)
Quizzes
Skills demonstrations

Other

Class work

Instructional Methodology

Specify the methods of instruction that may be employed in this course

Collaborative group work
Class activities
Class discussions
Demonstrations
Group discussions
Instructor-guided interpretation and analysis
Lecture
Small group activities

Describe specific examples of the methods the instructor will use:

The instructor will explain the reason for each review topic and activity, how it is relevant to the concepts covered in Materials Science and Engineering. The instructor will model problem solving and graphing and graph interpretations using the overhead projector and the whiteboard. Summary lecture notes and various worksheets will be provided for the students.

Representative Course Assignments

Writing Assignments

1. Problems selected from the bridge packet where answers require a written explanation of the solution, such as solving for the bonding energy between two ions using integration.
2. Assignments requiring complete solutions using both written English and symbolic mathematical language, such as calculate the planar density of the (111) and (110) planes and explain which plane will have higher energy for a chemical reaction.

Critical Thinking Assignments

1. Problem solving classwork questions, such as: Given the appropriate engineering equation and using the data provided, compute the diffusion coefficient for magnesium in aluminum at $550^{o}C$.

2. Graphing exercises, such as: Generate a spreadsheet that allows the user to input values for the constants A, B, and n in the net energy equation to plot graphs of potential energy versus inter-atomic separation for two atoms including attractive, repulsive, and net energy curves.

Reading Assignments

1. Read example problems from the bridge packet provided by the instructor, such as examples of using vector analysis to solve for resolved forces, stresses, and finding angles between two vectors.
2. Read definitions to learn the proper terminology necessary in problem-solving relevant to material science and engineering.

Skills Demonstrations

1. Work on materials science and engineering problems in small groups and demonstrate the mathematical skills necessary for problem solving.
2. Write problem solutions on the board such as how to convert from SI system (metric system) of units to US Customary units to demonstrate competency in unit conversion and dimensional analysis.

Outside Assignments

Representative Outside Assignments

1. Problems selected from the bridge packet where answers require a written explanation of the solution, such as graphing a stress and strain curve and explaining how the various mechanical properties of a metal can be ascertained from the graph.
2. Assigned reading from the bridge packet.

Textbooks and Lab Manuals

Resource Type

Other Instructional Materials

Description

Instructor-generated Bridge Packet containing the necessary relevant review materials for the course: Chemistry, Physics and Math content.

Resource Type

Textbook

Classic Textbook
No

Description
Callister, William, and David G.Rethwisch. *Materials Science and Engineering: An Introduction. 10th ed.,* Wiley, 2018.

Library Resources

Assignments requiring library resources
Reading, writing, problem solving exercises

Sufficient Library Resources exist
Yes

Example of Assignments Requiring Library Resources
Using the Library's print and online resources to provide support material for chemistry, physics, and math contents of this bridge course.

Primary Minimum Qualification
ENGINEERING TECHNOLOGY

Review and Approval Dates

Department Chair
11/24/2019

Dean
11/26/2019

Technical Review
12/05/2019

Curriculum Committee
01/21/2020

DTRW-I
02/13/2020

Curriculum Committee
MM/DD/YYYY

Board
03/10/2020

CCCCO
MM/DD/YYYY

DOE/accreditation approval date
MM/DD/YYYY