ENGR M916: BRIDGE TO ENGR M16 - ENGINEERING STATICS AND STRENGTH OF MATERIALS

Originator
srelle

College
Moorpark College

Discipline (CB01A)
ENGR - Engineering

Course Number (CB01B)
M916

Course Title (CB02)
Bridge to ENGR M16 - Engineering Statics and Strength of Materials

Banner/Short Title
Bridge to ENGR M16

Credit Type
Noncredit

Start Term
Fall 2020

Catalog Course Description
Prepares students for the prerequisite materials necessary to be successful in Engineering Statics and Strength of Materials course - ENGR M16. Includes physics and mathematics concepts such as treating forces as vectors, drawing free-body diagrams, applying Newton's laws of motion to static equilibrium, trigonometric principles, differentiation, integration, Cartesian vectors, vector addition and subtraction, vector magnitude and direction, vector dot product and cross product.

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)
6.0
Total Maximum Contact/In-Class Hours (for full semester or term; not weekly)
6.0

Total Student Learning

Total Student Learning
Total Minimum Student Learning Hours
6.0
Total Maximum Student Learning Hours
6.0

Student Learning Outcomes (CSLOs)

	Upon satisfactory completion of the course, students will be able to:
1	recognize the importance of physics concepts as applied to the field of engineering.
2	use appropriate mathematical operations to simplify and manipulate engineering equations.

Course Objectives

	Upon satisfactory completion of the course, students will be able to:
1	draw position and force vectors and determine their magnitudes and directions.
2	resolve a vector into its components and solve for the resultant vector in Cartesian form and scalar form using the Pythagorean Theorem.
3	perform unit analysis.
4	apply Newton's laws of motion in analyzing statics problems.
5	draw free body diagrams.
6	perform vector dot product and cross product.

Course Content

Lecture/Course Content

1. **(10%) - Review of Newton's Laws of Motion**
2. **(5%) - Scalars and Vectors**
3. **(35%) - Vector Operations - Forces**
    a. Multiplication and division of a vector by a scalar
    b. Vector addition
    c. Resolving a vector into its components
    d. Resultant vector: magnitude and direction
    e. Cartesian vector form
        i. magnitude
        ii. direction
        iii. addition
    f. Position vector
        i. unit vector
4. **(25%) - Review of Certain Mathematical Concepts**
    a. Differentiation
    b. Integration
    c. Trigonometric functions
    d. Pythagorean Theorem
    e. Sine Law
    f. Cosine Law
    g. Dot product
    h. Cross product
5. **(10%) - Unit Analysis**
    a. Conversion factors
    b. Units
    c. Dimensional analysis
6. **(15%) - Drawing Free Body Diagrams**

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 the Statics and Strength of Materials course. The instructor will model problem solving 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 projection of a force along a certain direction and explaining its physical meaning.
2. Assignments requiring complete solutions using both written English and symbolic mathematical language, such as determining the angle between two forces such that the resultant force is a minimum.

Critical Thinking Assignments

1. Problem solving classwork questions, such as: If the resultant force of two tugboats is required to be directed towards the positive x-axis, and one of the tugboats is supposed to apply the minimum force, determine the magnitude of that minimum force and the direction of its application, given that the other tugboat is applying a force of 2kN at a 30^{o} angle above the horizontal.

2. Free body diagram exercises, such as: Given the following typical examples of actual supports, identify the external forces acting on the object and draw the appropriate free-body diagrams.

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 and finding angles between two vectors.
2. Read definitions to learn the proper terminology necessary in problem solving relevant to statics and strength of materials.

Skills Demonstrations

1. Work on statics and strength of materials 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 of units to US Customary units to demonstrate competency in unit conversion and dimensional analysis.

Outside Assignments

Representative Outside Assignments

1. 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: physics and math content.

Resource Type

Textbook

Classic Textbook

No

Description
Hibbeler, Russell. *Statics and Mechanics of Materials.* 5th ed., Pearson, 2016.

Resource Type
Textbook

Classic Textbook
No

Description
Beer, F.P., Russell, J.E., DeWolf, J.T., and Mazurek, D. (2016). *Statics and mechanics of materials*, (2nd ed.). McGraw-Hill Education.

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 physics and math contents of this bridge course, such as problems involving vector analysis.

Primary Minimum Qualification
ENGINEERING TECHNOLOGY

Review and Approval Dates

Department Chair
11/26/2019

Dean
11/26/2019

Technical Review
01/16/2020

Curriculum Committee
MM/DD/YYYY

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