EASTERN ARIZONA COLLEGE
Engineering Mechanics I – Statics
Course Design
2017-2018

Course Information

Division	Mathematics
Course Number	EGR 214
Title	Engineering Mechanics I - Statics
Credits	3
Developed by	Thomas R. Palmer
Lecture/Lab Ratio	2 Lecture/3 Lab

Transfer Status

ASU	NAU	UA
Valid thru Fall 2016: CEE 210, EGR Dept Elective, MAE Dept Elective	CENE 251	CE 214

Activity Course	No
CIP Code	14.0101
Assessment Mode	Pre/Post Test (7 Questions/100 Points)
Semester Taught	Spring
GE Category	None
Separate Lab	No
Awareness Course	No
Intensive Writing Course	No

Prerequisites

MAT 220 and PHY 211 with a grade of "C" or higher or concurrent enrollment in MAT 220 and PHY 211

Educational Value

This is a required sophomore-level course for the majority of engineering disciplines.

Description

First semester course on engineering mechanics which includes topics such as problem formulation and solution methods; two- and three-dimensional vector representation of forces, moments and couples; static equilibrium of particles, rigid bodies and engineering structures; analysis of external and internal forces in structures utilizing free-body diagrams; and properties of cross-sectional areas.

Supplies

Scientific Calculator, Engineering Graph Paper, Mechanical Pencil, Straight-Edge.

Competencies and Performance Standards

1. Solve static equilibrium problems.

Learning objectives

What you will learn as you master the competency:

a. Mathematically describe a particle in equilibrium and a rigid body in equilibrium.

b. Solve problems involving ideal systems and real systems.

c. Calculate mechanical efficiencies.

d. Use energy criterion to solve equilibrium problems.

Performance Standards

You will demonstrate your competence:

- on assigned activities
- on written exams
- on a two-hour cumulative final exam

Your performance will be successful when:

- learner understands equilibrium of particles and rigid bodies
- learner understands the assumptions of an ideal system and the complications of real systems
- learner calculates mechanical efficiency
- learner understands the concept of potential energy and the energy criterion for equilibrium

2. Solve problems involving friction forces between contacting surfaces.

Learning objectives

What you will learn as you master the competency:

a. Discuss effects of friction on the operation of common devices.

b. Perform calculations, accounting for friction forces.

c. Solve problems involving simple machines.

Performance Standards

You will demonstrate your competence:

- on assigned activities
- on written exams
- on a two-hour cumulative final exam

Your performance will be successful when:

- learner understands how friction influences machine function and design
- learner accounts for the effects of friction in problem solving
- learner solves problems involving wedges, screws, bearings, disks, and belts

3. Solve problems relating to force distributions and their effects.

Learning objectives

What you will learn as you master the competency:

a. Discuss force distributions using real-world examples.

b. Perform calculations to determine centroid and center of mass.

c. Draw beam diagrams showing applied loads and resultant force and moment distributions.

d. Solve problems involving flexible cables in tension.

e. Determine hydrostatic forces on a dam.

Performance Standards

You will demonstrate your competence:

- on assigned activities
- on written exams
- on a two-hour cumulative final exam

Your performance will be successful when:

- learner understands that forces may be distributed over lines, areas or volumes
- learner performs calculations to determine the centroid or center of mass
- learner understands shear and moment distributions in beams
- learner calculates tensions in flexible cables
- learner understands the effects of hydrostatic pressure

4. Solve problems relating to the distribution of forces on trusses and frames.

Learning objectives

What you will learn as you master the competency:

a. Discuss truss design and materials of construction.

b. Translate mechanical drawing into accurate free-body diagram.

c. Demonstrate problem solving using method of joints.

d. Demonstrate problem solving using method of sections.

e. Determine forces in various three-dimensional trusses, frames, and machines.

Performance Standards

You will demonstrate your competence:

- on assigned activities
- on written exams
- on a two-hour cumulative final exam

Your performance will be successful when:

- learner understands that truss design involves determination of forces and selection of structural materials
- learner constructs an accurate free body diagram for trusses
- learner uses the method of joints to compute the forces in each member
- learner uses the method of sections to determine forces in a simple truss
- learner solves problems involving three-dimensional trusses, frames and machines

5. Solve problems relating to the concept of equilibrium in two and three dimensions.

Lea*rning objectives*

What you will learn as you master the competency:

a. Show examples for which the sums of forces and moments are zero.

b. Translate mechanical drawing into accurate free body diagrams.

c. Become proficient at solving equilibrium problems in two and three dimensions.

Performance Standards

You will demonstrate your competence:

- on assigned activities
- on written exams
- on a two-hour cumulative final exam

Your performance will be successful when:

- learner understands that the concept of equilibrium is derived from a balance of forces
- learner constructs accurate free body diagrams
- learner extends concepts learned in two-dimensional systems to three-dimensional systems

6. Solve problems illustrating the properties of forces, moments, couples, and resultants.

Learning objectives

What you will learn as you master the competency:

a. Demonstrate correct and complete description of forces.
b. Perform calculations involving resolution of forces.
c. Perform calculations involving couples and moments.
d. Determine resultant forces for various coplanar and three-dimensional force systems.

Performance Standards

You will demonstrate your competence:

- on assigned activities
- on written exams
- on a two-hour cumulative final exam

Your performance will be successful when:

- learner describes forces in terms of magnitude, direction and point of application
- learner resolves a force into its rectangular components
- learner understands the concepts of couples and moments and use the "right hand rule" in problem solving
- learner determines the resultant of coplanar and three-dimensional force systems

7. Apply the basic principles of Mechanics and techniques of problem solving.

Learning objectives

What you will learn as you master the competency:

a. Apply the basic concepts of Mechanics in solving problems.
b. Use vectors in properly drawing diagrams.
c. Describe everyday situations in which Newton’s laws are demonstrated.
d. Demonstrate dimensional analysis techniques.
e. Demonstrate neat, methodical problem solving techniques.

Performance Standards

You will demonstrate your competence:

- on assigned activities
- on written exams
- on a two-hour cumulative final exam

Your performance will be successful when:

- o learner understands the basic concepts of space, time, matter, inertia, mass, bodies (rigid and deformable) and particles
- o learner understands the concepts of scalars and vectors, vector components and vector algebra
- o learner is able to state Newton's laws I-III verbally and mathematically
- o learner understands and demonstrates a methodical way of solving problems

Types of Instruction

Classroom presentation with assigned reading and homework

Grading Information

Grading Rationale

Each instructor has the flexibility to develop evaluative procedures within the following parameters.

1. Written exams must represent at least 60% of the final course grade
2. Final exam must represent at least 20% of the final course grade.
3. The Post Test is to be embedded in the final exam and must represent at least 10% of the final course grade (i.e., 50% of the Final Exam).
4. Other activities may represent at most 20% of the final course grade.

Grading Scale

A 90%-100%

B 80%-89%

C 70%-79%

D 60%-69%

F Below 60%