**I. COURSE TITLE:** Engineering Mechanics: Statics

**COURSE NUMBER:**  2201 **CATALOG PREFIX:** ENDS

**II. PREREQUISITE(S):** PHYS 1117 and MATH 1120

**III. CREDIT HOURS:** 3 **LECTURE HOURS:** 3

**LABORATORY HOURS:** 0 **OBSERVATION HOURS:** 0

**IV. COURSE DESCRIPTION:**

In this course the student studies the principles of forces, as applied to trusses, frames, beams, walls, and machine parts. The student will gain experience by solving problems graphically and mathematically. The course covers the study of vectors, forces, resultants, and equilibrium.

**V. ADOPTED TEXT(S):**

“Mechanics for Engineers: Statics and Dynamics”

4th Edition,

Beer & Johnston,

McGraw-Hill, Publisher

ISBN: 0-07-004584-4

**VI. COURSE OBJECTIVES:**

The Student will:

Develop the ability to analyze any mechanics problem in a simple and logical manner and to apply to its solution a few, well-understood basic concepts and principles.

These will include:

1. The concept of vectors and the laws governing the addition and resolution of vectors. Break force vectors into component and combine forces into a Resultant.
2. The concept of Statics or particles.
3. The Principle of Equilibrium. Evaluate systems in force and moment static equilibrium.
4. The concept of Statics of rigid bodies.
5. The Principle of Transmissibility.
6. The concept of Moment of force. Compute moment and couples.
7. The concept of Friction.

**The Course Objectives will align with the Ohio Board of Regents Learning Outcomes for OET 007 Statics: (see IX. Course Outline and XL. Evaluation)**

1. Break force vectors into components and combine forces into a resultant.
2. Compute moment and couples.
3. Evaluate systems in force and moment static equilibrium.
4. Determine forces on members in a truss, frame and pulley.
5. Apply friction laws to direction, wedges, belt, disk, incline.
6. Determine the centroid of areas.
7. Determine moments of inertia.

**VII. COURSE METHODOLOGY:**

May include but not limited to Lecture and problem solving, independent and group projects, in-class and home assignments, quizzes, and tests. Problem solving will use both graphical and mathematical methods.

Attendance is required.

**VIII. GRADING**

A= 90-100

B= 80-89

C= 70-79

D= 60-69

F= 0-59

See catalog for description of other possible grades.

**IX. COURSE OUTLINE:**

WEEK: MATERIAL:

1. Introduction, definition of mechanics, Fundamental Principles and Concepts, units, conversion of units, Method of problem solution, introduction/review Calculus (differentiation).
2. Forces on a particle, resultants, addition of vectors, Graphical Method of addition.
3. Resolution of force into components, rectangular components.

Addition of forces by summing components.

1. Equilibrium of a particle, Newton’s First Law of Motion, Free-body diagram.

Test One

1. Rigid bodies in two dimensions, equivalent systems of forces, external and internal forces, Principle of Transmissibility.
2. Equivalent forces. Two-dimensional structures. Moment of force about an axis. Varignon’s Theorem, Moment of a Couple.
3. Reduction of a system of forces, equivalent couples, addition of couples.
4. Resolution of a given force, reduction of a system of forces, equivalent systems of coplanar forces.

Test two

1. Equilibrium of rigid bodies, Free-Body Diagram, reactions at supports, two-force and three-force bodies in equilibrium.
2. Distributed forces, center of gravity, centroids of areas and lines, First Moments of area and lines, composite plates and wires.
3. Distributed loads. Moments of Inertia. Center of Gravity. Composite bodies.

Test three

1. Analysis of structures, Trusses, definition of a Truss, simple Trusses, analysis of a Truss by Method of Joints, analysis of Trusses by Method of Sections.
2. Frames, Multiforce Member, Analysis of a Frame. Machines. Forces on a pulley.
3. Beams. Forces in beams, internal forces in members, bending moment diagrams, relations among load, shear, and bending moment.
4. Friction, the laws of dry friction, coefficients of friction, angles of friction. Wedges, screws, belt friction

Week 16: **Final Exam**

**X. OTHER REQUIRED TEXTS, SOFTWARE, AND MATERIALS:**

Scientific calculator

Scale and Protractor

Graphing paper (1/4” squares)

A 3-ring binder for keeping correct solution of assigned problems.

Paper for solution of problems pre-printed with outline will be provided

Student will need an auxiliary storage device, flash drive or network home-drive.

**XI. EVALUATION:**

Assignments count – 30% of Final Grade

Attendance counts – 10% of Final Grade

(3) Tests count – 40% of Final Grade

Final counts – 20% of Final Grade

Note well:

Class participation – it is your class, and your participation improves it.

Class attendance – text covers 50% of material, in-class the other 50%.

Evaluation:

Development of ability to analyze mechanics problems and present the results. The retention of general information, data handling skills, and increased speed and accuracy.

Assessment will follow the objectives using OETEA assessment rubric:

Break force vectors into components and combine forces into a resultant.

Compute moment and couples.

Evaluate systems in force and moment static equilibrium.

Determine forces on members in a truss, frame and pulley.

Apply friction laws to direction, wedges, belt, disk, incline.

Determine the centroid of areas.

Determine moments of inertia.

Analyze forces, unit vectors, components in 3-D. (optional, time permitting).

**XII. SPECIFIC MANAGEMENT REQUIREMENTS:**

Note well:

All assignments and tests must be turned in on time. Students may work on their own time to complete the assignments. Some group work is encouraged on exercises and assignments. Assignments must be in 3-ring binder.

Examinations will include written and graphical components.

For credit, all assignments will be completed as scheduled.

No test may be taken late without prior approval of instructor.

No make-up tests. Read your student handbook.

**XIII. OTHER INFORMATION:**

**FERPA:** Students need to understand that your work may be seen by others.

Others may see your work when being distributed, during group project work, or if it is chosen for demonstration purposes.

Students also need to know that there is a strong possibility that your work may be submitted to other entities for the purpose of plagiarism checks.

**DISABILITIES:** Students with disabilities may contact the Disabilities Service Office, Central Campus, at 800-628-7722 or 937-393-3431.