

MET-2610: STATICS

Cuyahoga Community College

Viewing: MET-2610 : Statics

Board of Trustees:

March 2023

Academic Term:

Fall 2023

Subject Code

MET - Mech Eng/Manuf Ind Eng Tech

Course Number:

2610

Title:

Statics

Catalog Description:

Course designed for students planning to transfer to a 4-year engineering program. Covers mechanics of forces and loads in static equilibrium. Includes fundamentals of particle statics in 2D and 3D. Emphasis on rigid bodies equivalent force systems, equilibrium of rigid bodies in 2D and 3D, centroids and centers of gravity, friction, and analysis of trusses, frames, and beams; Also covers moments of inertia and radii of gyration; and method of virtual work.

Credit Hour(s):

3

Lecture Hour(s):

3

Requisites

Prerequisite and Corequisite

MATH-1610 Calculus I and PHYS-2310 General Physics I, or concurrent enrollment.

Outcomes

Course Outcome(s):

Apply the principles of force vectors to determine force transmission in simple machines, trusses, frames, and beams.

Objective(s):

1. Calculate external force reactions.
2. Calculate internal member forces in a truss.
3. Calculate internal pin reactions in a frame.
4. Determine internal forces for a frame member.
5. Resolve forces into components in two and three dimensions.
6. Use principles of statics to design simple structures and machines.
7. Use the method of virtual work.

Course Outcome(s):

Apply appropriate calculations to demonstrate the principles of the nature of friction and frictional forces.

Objective(s):

1. Solve static dry friction problems.
2. Determine the force required for impending motion.

Course Outcome(s):

Draw Free Body diagrams for particles and rigid bodies.

Objective(s):

1. Draw Free Body diagrams for particles and rigid bodies.
2. Determine the proper unknown reactions associated with a support.
3. Calculate moments of forces in two- and three dimensions.
4. Resolve forces into components in two- and three dimensions.
5. Use principles of statics to design simple structures and machines.

Course Outcome(s):

Apply appropriate calculations to problems to demonstrate the principles of centers of gravity and centroids.

Objective(s):

1. Convert a distributed load to an equivalent point load at a single location.
2. Determine the center of gravity, center of mass, or centroid of a composite body.

Course Outcome(s):

Determine the values for moments of inertia and radii of gyration.

Objective(s):

1. Calculate moments of inertia and mass moments of inertia.
2. Calculate moments of forces in two- and three dimensions.

Methods of Evaluation:

- a. Assignments and projects
- b. Quizzes and/or midterm examination
- c. Final examination

Course Content Outline:

1. General Principles
 - Fundamental Concepts
 - Systems of Units and unit conversion
 - Numerical Calculations
2. Force Vectors
 - Scalars and vectors
 - Vector addition and subtractions
 - Addition of system of coplanar forces
3. Equilibrium of a Particle
 - Free-Body diagrams
 - Equations of equilibrium
4. Force System Resultants
 - Moment of a force and principle of moment
 - Resultant of concurrent and non-concurrent force systems
5. Equilibrium of a Rigid Body
 - Free-Body diagrams
 - Support types and equations of equilibrium
6. Structural Analysis
 - Simple trusses
 - Method of Joints
 - Method of sections
 - Frames and machines
 - Internal forces of trusses
7. Friction

- Characteristic of dry and wet friction
 - Problems involving dry friction
8. Center of Gravity and Centroid
- Center of gravity and centroid for simple bodies
 - Center of gravity and centroid for composite bodies
9. Moments of Inertia
- Calculating Moment of inertia for different cross-sections of trusses
 - Parallel-axis theorem for an area
10. Virtual Work
- Principle of virtual work
 - Apply principle of virtual work in solving problems

Resources

Hibbler, Russel. *Engineering Mechanics: Statics & Dynamics*. 15th. Pearson, 2022.

Beer, Johnston, Mazurek and Cornwell. *Vector Mechanics for Engineers: Statics*. 12th ed. McGraw-Hill, 2018.

Engineering Statics. *Open Learning Initiative: Register for a Course*. {ts '2014-10-21 00:00:00'}.

Statics and Dynamics: Foundations in Engineering. *Coursera*. Retrieved October 21, 2014,. {ts '2014-10-21 00:00:00'}.

Baker, Daniel W. and William Haynes. *Engineering Statics: Open and Interactive*. Daniel Baker and William Haynes, 2020. <https://open.umn.edu/opentextbooks/textbooks/1047>

Resources Other

None

Instructional Services

OAN Number:

Transfer Assurance Guide OES002

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