MET-1601: TECHNICAL STATICS

Cuyahoga Community College

Viewing: MET-1601 : Technical Statics

Board of Trustees:
January 2023

Academic Term:
Fall 2023

Subject Code
MET - Mech Eng/Manuf Ind Eng Tech

Course Number:
1601

Title:
Technical Statics

Catalog Description:
Study of forces on structures and machines at rest. Topics include composition and resolution of forces, moments, freebody diagrams, trusses, frames, simple machines, friction, centers of gravity, centroids, and plane and polar moments of intertia.

Credit Hour(s):
3

Lecture Hour(s):
3

Lab Hour(s):
0

Requisites

Prerequisite and Corequisite
MATH-1530 College Algebra; and PHYS-1210 College Physics I, or concurrent enrollment.

Outcomes

Course Outcome(s):
Determine the resultant of concurrent forces in a plane.

Objective(s):
1. Use the parallelogram and triangular methods for adding vectors to find their resultants.
2. Apply the method of rectangular components to find the resultant of two or more vectors.

Course Outcome(s):
Apply appropriate calculations to problems to show an understanding of the nature of friction and friction forces.

Objective(s):
1. Analyze common mechanical elements such as wedges, bearings, belts whose operations are affected by friction.
2. Solve problems of static equilibrium for which frictional effects must be considered.

Course Outcome(s):
Apply appropriate calculations to problems to show an understanding of centers of gravity and centroids.

Objective(s):
1. Solve problems of center of gravity to a variety of mechanical parts.

2. Solve problems of center of gravity for centroids.

Course Outcome(s):

Determine the value of plane moments of inertia.

Objective(s):

1. Calculate the rectangular moment of inertia for simple plane areas about centroidal axes.
2. Use the parallel axis theorem to determine rectangular moments of inertia.

Course Outcome(s):

Apply the principles of force vectors to determine force transmission in simple machines.

Objective(s):

1. Draw complete free-body diagrams for rigid bodies constrained by various types of supports.
2. Solve for any unknown forces acting on a point of equilibrium.
3. Compute the moment of a force about any selected point on an object.
4. Write and solve the equations of equilibrium for a rigid body or simple machine acted on by one or more external loads.

Course Outcome(s):

Apply the principles of force vectors to determine loads in members of simple trusses.

Objective(s):

1. Use the method of joints to analytically determine the force transmitted in each link of a plane truss and determine whether each link is in tension or compression.
2. Apply the method of rectangular components to find the resultant of two or more vectors.

Methods of Evaluation:

a. Assignments
b. Quizzes
c. Final examination

Course Content Outline:

a. Basic Concepts
    i. Review of gravitational and SI systems of units
    ii. Review of trigonometry
    iii. Technical computations
b. Resultant of Concurrent Forces in a Plane
    i. Force vectors
    ii. Components of a force
    iii. Resultant of concurrent forces
c. Equilibrium
    i. Conditions for equilibrium
    ii. Free – body diagrams
    iii. Rectangular components
d. Resultant of Nonconcurrent Forces in a Plane
    i. Transmissibility
    ii. Moment of a force
    iii. Theorem of moments
    iv. Couples
    v. Resultant of distributed loading
e. Equilibrium of a Rigid Body

i. Support conditions for bodies in a plane
ii. Construction of free – body diagrams
iii. Equations of equilibrium of a rigid body

f. Force Analysis of Structures and Machines
i. Simple plane trusses
ii. Method of joints
iii. Method of sections
iv. Frames and Machines

g. Friction
i. Angle of friction
ii. Wedges
iii. Square - threaded screws; screw jacks

h. Center of Gravity, Centroids, and Moments of Inertia
i. Center of gravity
ii. Centroid of a plane area
iii. Moment of inertia of a plane area
iv. Parallel axis theorem
v. Polar moment of inertia and radius of gyration

Resources

Bedford, Anthony and Wallace Fowler. *Engineering Mechanics: Statics.* 5th Ed. Upper Saddle River, NJ., 2008.

Beer, Ferdinand, E. Johnston, John DeWolf, David Mazurek. *Statics and Mechanics of Materials*. 3rd ed. McGraw Hill, 2021.

Hibbeler, Russell. *Structural Analysis.* 8th Ed. Upper Saddle River, NJ., 2012.

Hibbeler, Russell. *Statics and Mechanics of Materials.* 3rd Ed. Upper Saddle River, NJ., 2011.

Hibbeler, Russell C. *Engineering Mechanics: Statics & Dynamics*. 15th. NA: Prentice Hall, 2022.

Morrow, H.M. and Robert Kokernak. *Statics and Strength of Materials.* 7th Ed. Upper Saddle River, NJ., 2011.

Limbrunner and Leonard Spiegel. *Applied Statics and Strength of Materials*. Pearson Prentice Hall, 2020.

Plesha, Michael, Gary Gray, Robert J. Witt, Francesco Costanzo. *Engineering Mechanics: Statics and Dynamics*. 3rd ed. McGraw Hill, 2023.

Resources Other

a. Calculator.
b. Carnegie Mellon University's Engineering Statics Open Course Textbook http://oli.cmu.edu/courses/free-open/engineering-statics-course-details/

Instructional Services

OAN Number:

Transfer Assurance Guide OET007

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