MET-2610: STATICS

Cuyahoga Community College

Viewing: MET-2610 : Statics

Board of Trustees:
March 2023

Academic Term:
Fall 2026

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:

1. Assignments and projects
2. Quizzes and/or midterm examination
3. 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

Religious Accommodation

Before reviewing the course schedule, students should carefully review the following religious accommodation policy and other required instructional policies:

Religious Accommodation:

Students seeking an accommodation for absences permitted under Ohio's Testing Your Faith Act must provide the instructor with written notice of the specific dates for which the student requires an accommodation and must do so not later than fourteen (14) days after the first day of instruction. Please submit requests for accommodations at this link: https://portal2.tri-c.edu/ReligiousAccommodation/ Religious Accommodation Form. Students with questions about their religious accommodations under Ohio's Testing Your Faith Act may contact the College's Office of General Counsel and Legal Services by phone at 216.987.4856 or via email at legal@tri-c.edu.

Other Required Instructional Policies:

https://www.tri-c.edu/student-resources/curriculum/documents/syllabus-part-b.pdf

Weekly Schedule

	Topics
Week 1	- Welcome and Course Overview - Introduction & Foundations • Basic concepts of statics • SI and US customary unit systems and unit conversions • Technical computations and significant figures
Week 2	- MATH Review for Statics • Review of trigonometry and Vectors - Force Systems – Concurrent Forces • Force vectors and components • Rectangular Force components • Resultant of concurrent forces • Vector addition and resolution
Week 3	- Equilibrium of Concurrent Forces • Conditions for equilibrium • Free-body diagrams (FBDs)
Week 4	- Nonconcurrent Forces in a Plane • Moment of a force • Theorem of moments
Week 5	- Couples and Distributed Loads • Definition and properties of couples • Resultant of distributed loading • Applications in beams and supports
Week 6	- Equilibrium of a Rigid Body • Support conditions in 2D • Construction of FBDs for rigid bodies • Equations of equilibrium
Week 7	- Comprehensive review of Weeks 1–6 • Exam 1

Week 8	- Analysis of Structures – Trusses • Introduction to trusses • Method of joints
Week 9	- Analysis of Structures – Sections • Method of sections • Identifying zero-force members
Week 10	-Frames and Machines • Analysis of frames • Internal forces in machines • Exam 2 Review (Comprehensive review of Weeks 8–9)
Week 11	- Exam 2 - Friction Basics • Laws of dry friction • Angle of friction
Week 12	• Applications in wedges • Problems involving dry friction
Week 13	- Center of Gravity and Centroids • Center of gravity of bodies • Centroid of plane areas • Composite shapes
Week 14	- Moments of Inertia • Moment of inertia of plane areas • Parallel axis theorem
Week 15	- Virtual Work • Principle of virtual work • Apply principle of virtual work in solving problems
Week 16	- Final Review & Exam • Cumulative review of Weeks 1–15 • Final Exam

The Course Schedule is subject to change due to pedagogical needs, instructor discretion, parts of term, and unexpected events.

Required/Recommended Readings

Hibbeler, R. C. *Engineering mechanics: Statics*

Resources for the Instructor

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

Additional Resources for the Instructor

None

Instructional Services

OAN Number:
Transfer Assurance Guide OES002

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