STATE UNIVERSITY OF NEW YORK COLLEGE OF TECHNOLOGY
CANTON, NEW YORK

MASTER SYLLABUS

COURSE NUMBER – COURSE NAME
ENGS 201 – Statics

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Canino School of Engineering Technology Department: Engineering Science

Semester/Year: Spring 2023

K. **TITLE**: Statics

L. **COURSE NUMBER:** ENGS 201

M. **CREDIT HOURS: (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity)**

 # Credit Hours: 3
 # Lecture Hours: 2 **per week # Lab Hours: per week**
Other: **2 hr**

recitation per week

Course Length: 15 **Weeks**

N. **WRITING INTENSIVE COURSE**: Yes ☐ No ☒

O. **GER CATEGORY: None:** ☒ **Yes:** GER
***If course satisfies more than one*:** GER

P. **SEMESTER(S) OFFERED: Fall** ☒ **Spring** ☐ **Fall & Spring** ☐

Q. **COURSE DESCRIPTION:**

A vector approach to particle equilibrium, equivalent force systems, rigid body equilibrium and analysis of structure. Additional topics include friction, centroids and centers of gravity and moments of inertia.

R. **PRE-REQUISITES: None** ☐ **Yes** ☒ **If yes, list below:**

PHYS 121, College Physics or PHYS 131, University Physics 1 and MATH 123, pre-calculus

CO-REQUISITES: None ☒ **Yes** ☐ **If yes, list below:**

S. STUDENT LEARNING OUTCOMES: (*see key below*)

By the end of this course, the student will be able to:

Course Student Learning Outcome [SLO]	***Program Student Learning Outcome [PSLO]***	***GER*** *[If Applicable]*	***ISLO & SUBSETS***	
Determine the magnitude and direction of forces	a		2-Crit Think ISLO ISLO	CA IA PS Subsets
Calculate equivalent force systems	a		2-Crit Think ISLO ISLO	CA IA PS Subsets
Determine forces necessary for static equilibrium	a		2-Crit Think ISLO ISLO	CA IA PS Subsets
Apply frictional forces to vector analysis	a		2-Crit Think ISLO ISLO	CA IA PS Subsets
Determine the centroid and moments of inertia of various shapes	a		2-Crit Think ISLO ISLO	CA IA PS Subsets
Apply analytical techniques to frames, trusses, and simple machines	a, e		2-Crit Think 5-Ind, Prof, Disc, Know Skills 1-Comm Skills	W CA IA PS
Apply these skills in strength of material analysis.	a, e, k		2-Crit Think 5-Ind, Prof, Disc, Know Skills ISLO	CA IA PS Subsets

KEY	**Institutional Student Learning Outcomes [ISLO 1 – 5]**
ISLO #	**ISLO & Subsets**
1	**Communication Skills** Oral [O], Written [W]
2	**Critical Thinking** *Critical Analysis [CA] , Inquiry & Analysis [IA] , Problem Solving [PS]*
3	**Foundational Skills** *Information Management [IM], Quantitative Lit,/Reasoning [QTR]*
4	**Social Responsibility** *Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]*
5	**Industry, Professional, Discipline Specific Knowledge and Skills**

T. APPLIED LEARNING COMPONENT: Yes ☒ No ☐

If YES, select one or more of the following categories:

☒ Classroom/Lab	☐ Civic Engagement
☐ Internship	☐ Creative Works/Senior Project
☐ Clinical Placement	☐ Research
☐ Practicum	☐ Entrepreneurship
☐ Service Learning	(program, class, project)
☐ Community Service	

K. TEXTS:

Vector Mechanics for Engineers: Statics, Beer and Johnston, 12th edition (McGraw Hill)

R. REFERENCES:

Engineering Mechanics, Higdon and Stiles, Prentice Hall

S. EQUIPMENT: None ☒ Needed:

T. GRADING METHOD: A-F

U. SUGGESTED MEASUREMENT CRITERIA/METHODS:

- **Examinations**
- **Homework**
- **Comprehensive Final**

V. DETAILED COURSE OUTLINE:

I. Introduction

A. What Is Mechanics?
B. Fundamental Concepts and Principles
C. Units
D. Methods of Problem Solution
E. Numerical Accuracy

II. Statics of Particles

A. Forces in a Plane
1. **Forces on a Particle, Resultant of Two Forces**
2. **Vectors**
3. **Addition of Vectors**
4. **Resultant of Several Concurrent Forces**
5. **Resolutions of a Force into Components**
6. **Rectangular Components of a Force. Unit Vectors**
7. **Addition of Forces by Summing x and y components**

8. Equilibrium of a Particle
9. Newton's First Law of Motion
10. Problems Involving the Equilibrium of a Particle. Free-Body Diagram.

B. Forces in Space
1. Rectangular Components of a Force in Space
2. Force Defined by its Magnitude and Two Points on its Line of Action
3. Addition of Concurrent Forces in Space
4. Equilibrium of a Particle in Space

III. Rigid Bodies

A. Equivalent Systems of Force
1. Rigid Bodies. External and Internal Forces
2. Principle of Transmissibility. Equivalent Forces
3. Vector Product of Two Vectors
4. Vector Products Expressed in Terms of Rectangular Components
5. Moment of a Force About a Point
6. Varignon's Theorem
7. Rectangular Components of the Moment of a Force
8. Scalar Product of Two Vectors
9. Mixed Triple Product of Three Vectors
10. Moment of a Force about a Given Axis
11. Moment of a Couple
12. Equivalent Couples
13. Couples May Be Represented By Vectors
14. Reduction of a System of Forces to One Force and One Couple
15. Equivalent System of Forces
16. Further Reduction of a System of Forces

IV. Equilibrium of Rigid Bodies

A. Equilibrium of Rigid Bodies
1. Rigid Body in Equilibrium
2. Free-Body Diagram

B. Equilibrium in Two Dimensions
1. Reactions at Supports and Connections for a Two-Dimensional Structure
2. Equilibrium of a Rigid Body in Two Dimensions
3. Statically Indeterminate Reactions. Partial Constraints
4. Equilibrium of a Two-Force Body
5. Equilibrium of a Three-Force Body

C. Equilibrium in Three Dimensions
1. Reactions at Supports and Connections for a Three-Dimensional Structure
2. Equilibrium of a Rigid Body in Three Dimensions

V. Distributed Forces: Centroids and Centers of Gravity

A. Areas and Lines

1. **Center of Gravity of a Two-Dimensional Body**
2. **Centroids of Areas and Lines**
3. **Composite Plates and Wires**
4. **Determination of Centroids by Integration**
5. **Theorems of Pappas-Guldinus**

B. Volumes

1. **Center of Gravity of a Three-Dimensional Body. Centroid of a Volume**
2. **Composite Bodies**
3. **Determination of Centroids of Volumes By Integration**

VI. Analysis of Structures

A. Analysis of Structures

1. **Internal Forces. Newton's Third Law**

B. Trusses

1. **Definition of a Truss**
2. **Simple Trusses**
3. **Analysis of Trusses by the Methods of Joints**

C. Frames and Machines

1. **Structures Containing Multiforce Members**
2. **Analysis of a Frame**
3. **Frames Which Cease to be Rigid When Detached From Their Supports**
4. **Machines**

VII. Friction

A. Friction

1. **Introduction**
2. **The Laws of Dry Friction. Coefficients of Friction**
3. **Angles of Friction**
4. **Problems Involving Dry Friction**
5. **Wedges**
6. **Square-Threaded Screws**
7. **Journal Bearings. Axle Friction**
8. **Thrust Bearings. Disk Friction**
9. **Wheel Friction. Rolling Resistance**
10. **Belt Friction**

VIII. Distributed Forces: Moments of Inertia

A. Moments of Inertia of Area

7. Second Moment, Or moment of Inertia, or an Area

8. Determination of the Moment of Inertia of an Area By Integration

9. Polar Moment of Inertia

10. Radius of Gyration of an Area

11. Parallel-Axis Theorem

12. Moments of Inertia of Composite Areas

IX. Forces in Beams and Cables

A. Introduction. Internal Forces in Members

B. Beams

1. Various Types of Loading and Support

2. Shear and Bending Moment in a Beam

3. Shear and Bending Moment Diagrams

4. Relations Between Load, Shear, and Bending Moment

W. <u>LABORATORY OUTLINE</u>: None ☒ Yes