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

MASTER SYLLABUS

COURSE NUMBER – COURSE NAME
ENGS 202 – Dynamics

Created by: Arthur Hurlbut, Ph.D., P.E.

Updated by: J. Miles Canino, Ph.D.

Canino School of Engineering Technology

Department: Engineering Science

Semester/Year: Fall/2018

A. **TITLE**: Dynamics

B. **COURSE NUMBER:** ENGS 202

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

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

Course Length: 15 **Weeks**

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

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

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

G. **COURSE DESCRIPTION:**

This course is a vector approach to the solution of dynamics problems involving rectilinear motion, curvilinear motion, kinetics of particles, kinematics of rigid bodies and plane motion of rigid bodies. Newton's Laws, Work and Energy, Impulse and Momentum and Energy and Momentum Principles are used in the solutions.

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

ENGS 201: Statics

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

I. 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***	
Solve kinematic motion of particles	a, e		2-Crit Think ISLO ISLO	CA IA PS Subsets
Express Newton's laws of motion and apply them to the solutions of dynamic forced systems	a, e		2-Crit Think 1-Comm Skills ISLO	CA IA PS W
Solve kinetic and potential energy problems via conservation of energy	a, e		2-Crit Think ISLO ISLO	CA IA PS Subsets
Develop solutions to momentum and impulse motion.	a, e		2-Crit Think 1-Comm Skills ISLO	CA IA PS W
Use kinematics to solve rigid body mechanics for forces, velocities, and accelerations	a, e, k		2-Crit Think 1-Comm Skills ISLO	CA IA PS W
Solve systems involving angular motion.	a, e		2-Crit Think ISLO ISLO	CA IA PS Subsets
Understand the concepts of relative velocity and acceleration in plane motion.	a, e, k		2-Crit Think ISLO 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**

J. APPLIED LEARNING COMPONENT: Yes ☐ No ☒

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

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

K. TEXTS:

Vector Mechanics for Engineers: Dynamics, Beer and Johnston, McGraw Hill

L. REFERENCES:

N/A

M. EQUIPMENT: None ☒ Needed:

N. GRADING METHOD: A-F

O. SUGGESTED MEASUREMENT CRITERIA/METHODS:

- **Exams**
- **Quizzes**
- **Homework**
- **Participation**

P. DETAILED COURSE OUTLINE:

I. Introduction to Dynamics
II. Kinematics of Particles
- **A. Rectilinear Motion of Particles**
- **B. Curvilinear Motion of Particles**

III. Kinetics of Particles: Force, Mass, and Acceleration
- **A. Newton's Second Law of Motion**
- **B. Systems of Units**
- **C. Equations of Motion. Dynamic Equilibrium**
- **D. Systems of Particles. D'Alembert's Principle**
- **E. Motion of the Mass Center of a System of Particles**
- **F. Rectilinear Motion of a Particle**
- **G. Curvilinear Motion of a Particle**
- **H. Newton's Law of Gravitation**

IV. Kinetics of Particles: Work and Energy
- **A. Introduction**
- **B. Work of a Force**
- **C. Kinetic Energy of a Particle. Principle of Work and Energy**

- D. Applications of the Principle of Work and Energy
- E. Systems of Particles
- F. Potential Energy. Conservative Forces
- G. Conservation of Energy
- H. Power and Efficiency

V. Kinetics of Particles: Impulse and Momentum
- A. Principle of Impulse and Momentum
- B. Systems of Particles
- C. Impulsive Forces
- D. Conservation of Momentum
- E. Impact
- F. Direct Central Impact
- G. Oblique Central Impact
- H. Problems Involving Energy and Momentum
- I. Angular Momentum of a Particle
- J. Angular Momentum of a System of Particles
- K. Generalized Principle of Impulse and Momentum
- L. Conservation of Angular Momentum
- M. Application to Space Mechanics

VI. Kinematics of Rigid Bodies
- A. Introduction
- B. Translation
- C. Rotation About a Fixed Axis
- D. Equations Defining the Rotation of a Rigid Body about a Fixed Axis
- E. General Plane Motion
- F. Absolute and Relative Velocity in Plane Motion
- G. Instantaneous Center of Rotation in Plane Motion
- H. Absolute and Relative Acceleration in Plane Motion
- I. Motion about a Fixed Point
- J. General Motion

VII. Plane Motion of Rigid Bodies: Forces and Accelerations
- A. Introduction
- B. Plane Motion of a Rigid Body
- C. Solution of Problems Involving the Plane Motion of a Rigid Body
- D. Systems of Rigid Bodies
- E. Constrained Plane Motion

VIII. Plane Motion of Rigid Bodies: Energy and Momentum Methods
- A. Principle of Work and Energy for a Rigid Body
- B. Work of Forces Acting on a Rigid Body
- C. Kinetic Energy of a Rigid Body in Plane Motion
- D. Systems of Rigid Bodies
- E. Conservation of Energy
- F. Power
- G. Principle of Impulse and Momentum for a Rigid Body
- H. Momentum of a Rigid Body in Plane Motion
- I. Application of the Principle of Impulse and Momentum to the Analysis of the Plane Motion of a Rigid Body
- J. Systems of Rigid Bodies
- K. Conservation of Angular Momentum
- L. Eccentric Impact

Q. <u>LABORATORY OUTLINE</u>: None ☒ Yes ☐