COURSE SYLLABUS

LAST REVIEW	Spring 2021
COURSE TITLE	Dynamics
COURSE NUMBER	NASC-0249
DIVISION	Math, Science, Business & Technology
DEPARTMENT	Physical Sciences
CIP CODE	24.0101
CREDIT HOURS	3
CONTACT HOURS/WEEK	Class: 3
PREREQUISITES	NASC-0245, Engineering Physics I **AND** MATH-0123, Calculus and Analytic Geometry II
COURSE PLACEMENT	None

COURSE DESCRIPTION
The course covers kinematics and kinetics of particles, work and kinetic energy, impulse and momentum, rigid body dynamics, relative motion, and moving coordinate system. Schedule: 3 hours of lectures per week. The course is currently being offered spring semester only.

TEXTBOOKS
http://kckccbookstore.com/

METHODS OF INSTRUCTION
A variety of instructional methods may be used depending on content area. These include but are not limited to: lecture, multimedia, cooperative/collaborative learning, labs and demonstrations, projects and presentations, speeches, debates, panels, conferencing, performances, and learning experiences outside the classroom. Methodology will be selected to best meet student needs.

COURSE OUTLINE
I. Kinematics of a Particle
   A. Rectilinear Kinematics
   B. Curvilinear, Projectile and Relative Motion
II. Kinematics of a Particle: Force and Acceleration
   A. Newton's Laws of Motion
   B. Equation of Motion in Various Coordinate Systems
   C. Central-Force Motion and Space Mechanics

III. Kinematics of Particle: Work and Energy
   A. Work, Force and Energy
   B. Power and Efficiency
   C. Conservative Forces and Potential Energy
   D. Conservation of Energy
IV. Kinematics of a Particle: Impulse and Momentum
   A. Conservation of Momentum and Collisions
   B. Angular Momentum
   C. Steady Fluid Streams and Propulsion with Variable Mass
V. Planar Kinetics of a Rigid Body
   A. Translation
   B. Rotation about a Fixed Axis
   C. Relative-Motion Analysis: Velocity and Acceleration
   D. Instantaneous Center of Zero Velocity
VI. Planar Kinetics of a Rigid Body: Force and Acceleration
   A. Moment of Inertia
   B. Equations of Motion
VII. Planar Kinetics of a Rigid Body: Work and Energy
   A. Kinetic Energy, Work and Force
   B. Conservation of Energy
VIII. Planar Kinetics of a Rigid Body: Impulse and Momentum
   A. Impulse, Linear Momentum and Angular Momentum
   B. Conservation of Momentum
IX. Three Dimensional Kinematics/Kinetics of a Rigid Body
   A. Rotation about a Fixed Point
   B. General and Relative Motion
   C. Moments and Products of Inertia
   D. Angular Momentum and Kinetic Energy
   E. Equations of Motion
X. Vibrations
   A. Undammed Free and Forced Vibration
   B. Energy Methods
   C. Viscous Damped Free and Forced Vibrations
   D. Electrical Circuit Analogs

COURSE LEARNING OUTCOMES AND COMPETENCIES

Upon successful completion of this course, the student will:

A. Be able to demonstrate knowledge of the kinematic equations of motion of a particle using various types of coordinate systems.
   1. The learner will be able to calculate and illustrate the motion of a particle.
   2. The learner will be able to use various type of coordinate to describe the motion of a particle.
   3. The learner will be able to analyze projectile motion.
   4. The learner will be able to describe the relative motion of two particles.

B. Be able to demonstrate knowledge of the kinetics of a particle and the concepts of force, acceleration, work, energy, impulse and momentum applied to such a particle
   5. The learner will be able to apply Newton's Laws of Motion to a system of particles.
   6. The learner will be able to determine the equations of motion of a particle in different coordinate systems.
   7. The learner will be able to analyze central-force problems and problems involving space mechanics.
   8. The learner will be able to calculate the work done by a force.
   9. The learner will be able to apply the principles of work, energy, and conservation of energy to particles.
   10. The learner will be able to calculate power and efficiencies.
   11. The learner will be able to apply the principles of impulse and momentum to collisions between particles.
   12. The learner will be able to analyze steady fluid flow and propulsion problems with variable mass.

C. Be able to demonstrate knowledge of the kinematic equations of motion of a rigid body
   13. The learner will be able to calculate and illustrate the rotational motion of a rigid body.
   14. The learner will be able to analyze relative motion of rigid bodies.
   15. The learner will be able to calculate moments of inertia of rigid bodies.
   16. The learner will be able to determine the equations of motion of rigid bodies.
   17. The learner will be able to apply the principles of work, energy, and conservation of energy to rotating rigid bodies.
   18. The learner will be able to apply the principles of impulse, momentum, and conservation of momentum to rotating rigid bodies.

D. Be able to demonstrate knowledge of the kinematics of a rigid body in three dimensions.
   19. The learner will be able to describe the motion of rigid bodies in three dimensions.
   20. The learner will be able to analyze various types of simple vibration problems.
   21. The learner will be able to identify the Scientific method as a process of science.

ASSESSMENT OF COURSE LEARNING OUTCOMES AND COMPETENCIES

Student progress is evaluated through both formative and summative assessment methods. Specific details may be found in the instructor's course information document.

COLLEGE POLICIES AND PROCEDURES

Student Handbook
https://www.kckcc.edu/files/docs/student-resources/student-handbook-and-code-of-conduct.pdf

College Catalog
https://www.kckcc.edu/academics/catalog/index.html

College Policies and Statements
https://www.kckcc.edu/about/policies-statements/index.html

Accessibility and Accommodations
https://www.kckcc.edu/academics/resources/student-accessibility-support-services/index.html.