SYLLABUS

DATE OF LAST REVIEW: 02/2013
CIP CODE: 24.0101
SEMESTER: DEPARTMENTAL SYLLABUS
COURSE TITLE: Dynamics
COURSE NUMBER: NASC0249
CREDIT HOURS: 3
INSTRUCTOR: DEPARTMENTAL SYLLABUS
OFFICE LOCATION: DEPARTMENTAL SYLLABUS
OFFICE HOURS: DEPARTMENTAL SYLLABUS
TELEPHONE: DEPARTMENTAL SYLLABUS
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KCKCC-issued email accounts are the official means for electronically communicating with our students.

PREREQUISITE(S): Engineering Physics I-NASC-0245 and Calculus and Analytic Geometry II-MATH-0123.

REQUIRED TEXT AND MATERIALS: Please check with the KCKCC bookstore, http://www.kckccbookstore.com, for the required texts for your particular class.

COURSE DESCRIPTION:
This is a three-credit hour course involving lecture/recitation with strong emphasis on problem solving using vector notation. It is designed to give a general background in engineering mechanics (dynamics) for all students majoring in engineering.

METHOD OF INSTRUCTION:
A variety of methods is used depending on the content area. These include but 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

IV. 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

V. Vibrations
   A. Undammed Free and Forced Vibration
   B. Energy Methods
   C. Viscous Damped Free and Forced Vibrations
   D. Electrical Circuit Analogs

EXPECTED LEARNER OUTCOMES:

A. The learner will be able to demonstrate knowledge of the kinematic equations of motion of a particle using various types of coordinate systems

B. The learner will 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

C. The learner will be able to demonstrate knowledge of the kinematic equations of motion of a rigid body
D. The learner will be able to demonstrate knowledge of the kinematics of a rigid body in three dimensions

COURSE COMPETENCIES:

The learner will 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.

The learner will 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.

The learner will 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.

The learner will 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 LEARNER OUTCOMES:
Student progress is evaluated by means that include, but are not limited to, exams, written assignments, and class participation.

SPECIAL NOTES:
This syllabus is subject to change at the discretion of the instructor. Material included is meant to provide and outline of the course and rules that the instructor will adhere to in evaluating the student’s progress. However, this syllabus is not intended to be a legal contract. Questions regarding the syllabus are welcome at any time.

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