COURSE SYLLABUS

LAST REVIEW	Spring 2021
COURSE TITLE	General Physics I and Lab
COURSE NUMBER	NASC-0231
DIVISION	Math, Science, Business & Technology
DEPARTMENT	Physical Sciences
CIP CODE	24.0101
CREDIT HOURS	5
CONTACT HOURS/WEEK	Class: 3 Lab: 4
PREREQUISITES	MATH-0105/0106, College Algebra w/wo Review
COURSE PLACEMENT	Students must meet the correct placement measure for this course. Information may be found at: https://www.kckcc.edu/admissions/information/mandatory-evaluation-placement.html

COURSE DESCRIPTION
Physics I is the study of translational and rotational motion, force, work, mechanical and thermal energy, linear and angular momentum, and fluid mechanics using the tools of algebra and trigonometry.

KANSAS SYSTEMWIDE TRANSFER: PHY 1010/1011/1012
The learning outcomes and competencies detailed in this course outline or syllabus meet or exceed the learning outcomes and competencies specified by the Kansas Core Outcomes Groups project for this course as approved by the Kansas Board of Regents.

General Education Learning Outcome
☐ Basic Skills for Communication
☐ Mathematics
☐ Humanities
☒ Natural and Physical Sciences
☐ Social and Behavioral Sciences

Institutional Learning Outcomes
☐ Communication
☒ Computation and Financial Literacy
☒ Critical Reasoning
☒ Technology and Information Literacy
☐ Community and Civic Responsibility
☐ Personal and Interpersonal Skills

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
The tentative course outline is described below & is subject to change as the course development dictates.

I. Measurements & Units, & Vectors
   A. Introduction
   B. SI system
   C. Dimensional Analysis
   D. Significant Figures
   E. Vectors
II. Motion in 1D & 2D
   A. Displacement, Velocity & Acceleration
   B. Motional Diagrams
   C. 1D Motion with Constant Acceleration
   D. Free Falling Objects
   E. Displacement, Velocity & Acceleration in 2D
   F. 2D Motion & Projectile Motion
   G. Relative Velocity
III. Newton's Laws of Motion
   A. Force
   B. Laws of Motion
   C. Static and Kinetic Friction
   D. Applications of Newton's Laws
   E. Two-Body Problems
IV. Energy & Momentum
   A. Work, Work done by a Constant Force & Varying force
   B. Energy, Mechanical Energy, Conservative & Non-conservative forces
   C. Isolated & Non-Isolated System
   D. Power, Momentum, Collision in 1D & 2D
   E. Center of Mass, System of Particles, Rocket Propulsion
V. Rotational Dynamics
   A. Rotational motion, Rotational Kinematics, Moment of Inertia & Torque
   B. Rolling Motion, Angular Momentum, Conservation of Angular Momentum
   C. Precession, Equilibrium
VI. Equilibrium & Elasticity

A. Rigid Object in Equilibrium, Center of Gravity
B. Elastic Properties of Solids

VII. Gravity & Gravitation
A. Laws of Gravitation, Free Fall, Gravitational Field, Potential Energy
B. Planetary & Satellite Motion
C. Escape Velocity

VIII. Fluid Mechanics
A. Pressure, Archimedes' Principle & Bernoulli's Principle
B. Fluid dynamics & Applications

IX. Oscillatory Motion
A. Simple Harmonic Motion, Circular Motion, Pendulum
B. Damped & Forced Oscillations

X. Wave Motion & Sound Waves
A. Traveling Waves, Waves on Strings
B. Reflection & Transmission, Sinusoidal Waves, Linear Wave Equation
C. Sound wave, Doppler shifts, Digital Recording, Interference
D. Waves in Boundary Conditions, Standing Waves, Non-Sinusoidal Wave Pattern

XI. Heat & Thermodynamics
A. Zeroth law of thermodynamics, Thermal Expansion
B. Heat & Internal Energy & First Law of Thermodynamics
C. Ideal gas, Equipartition of Energy, Molecular Speed Distribution
D. Second Law of Thermodynamics, Refrigerator, Carnot Engine, Entropy

COURSE LEARNING OUTCOMES AND COMPETENCIES

Upon successful completion of this course, the student will:

A. Be able to demonstrate the knowledge of measurements, units, and dimensions.
1. The learner will be able to explain SI and British Systems of measurements and convert one system into another.
2. The learner will be able to use significant figure in doing scientific measurements and calculations and do the error analysis.
3. The learner will be to physics problems involving vector algebra.

B. Be able to demonstrate the knowledge of motion in one and two dimensions.
4. The learner will be able to derive kinematic equations in 1D and 2D and apply those equations to solve various kinematic problems that involves distance, displacement, speed, velocity an acceleration.
5. The learner will be able to apply kinematic equations to solve problems involving free fall.
6. The learner will be able to convert motion problems into motional diagrams and vice versa.
7. The learner will be able to solve problems involving two-dimensional kinematics and various types of projectile motion.

C. Be able to demonstrate the knowledge Of Newton's Laws of motion.

8. The learner will be able to demonstrate force, mass, and weight.
9. The learner will be able calculate static and kinetic frictional forces.
10. The learner will be able to explain and demonstrate Newton's 3 laws of motions.
11. The learner will be able to apply Newton's laws to solve problems such as elevator. problem, Atwood' Machine and other two body problems.

D. Be able to demonstrate the knowledge of work and work-energy relation
12. The learner will be able to calculate work done by various types of forces.
13. The learner will be able to calculate work done by a varying force.
14. The learner will be able to derive work-energy equations.
15. The learner will be able to solve various types motion problems using conservation of mechanical energy and work-energy equations.
16. The learner will be able to calculate power of a mechanical system.

E. Be able to demonstrate the knowledge of momentum and collisions
17. The learner will be able to solve problems involving momentum and kinetic energy of a particle.
18. The learner will be able to solve problems involving elastic and inelastic collision.
19. The learner will be able to solve problems involving 2D elastic collisions.
20. The learner will be able to solve problems involving rocket propulsion.

F. Be able to demonstrate the knowledge of rotational motion, rotational equilibrium, and rotational dynamics.
21. The learner will be able to derive rotational kinematic equations and solve problems involving rotational motions of geometric objects.
22. The learner will be able to calculate moment of inertia of various geometries objects.
23. The learner will be able solve two body rotational problems such as Atwood Machine and inclined plane using Newton's second law in rotation as well as conservation of mechanical energy in rotation.
24. The learner will be able to solve problems in rotational equilibrium of a system.
25. The learner will able to explain how the gyroscope works.

G. Be able to demonstrate the knowledge of gravity and gravitation.
26. The learner will be able to explain Kepler's laws.
27. The learner will be able to solve problems involving gravitational potential energy of a system of two or more masses.
28. The learner will be able to solve problems involving the velocity of satellites, geosynchronous satellites, and geostationary satellites.
29. The learner will be able to calculate escape velocity of a satellite.

H. Be able to demonstrate the knowledge of fluids and fluid dynamics.
   30. The learner will be able to calculate force buoyancy in liquid and air.
   31. The learner will be able to solve problems related to Archimedes' Principle.
   32. The learner will be able to solve problems involving Bernoulli's principle.

I. Be able to demonstrate the knowledge of simple harmonic motion and mechanical waves in various medium.
   33. The learner will be able to derive equations for various simple harmonic oscillation systems such as simple pendulum, spring-mass oscillation, physical pendulum, circular motion of a particle, torsional pendulum and apply to solve related problems.
   34. The learner will be able to explain damped oscillations and forced oscillations
   35. The learner will be able to analyze travelling waves and find frequency, amplitude, time-period and speed of a traveling wave in air and on a string or rope.
   36. The leaner will be able to explain interference and diffraction of waves.
   37. The learner will be able to solve problems involving doppler effect, standing waves in air column and beats

J. Be able to demonstrate the knowledge of heat, temperature, and equation of state.
   38. The learner will be able to demonstrate the difference between heat and temperature.
   39. The learner will be able to solve problems involving heat capacity, specific heat capacity and change of state.
   40. The learner will be able to calibrate a thermometer.
   41. The learner will be able to calculate the thermal expansion of solids and liquids.
   42. The learner will be able to solve problems involving specific heat capacity and phase change.

K. Be able to demonstrate the knowledge of Thermodynamics.
   43. The learner will be able to solve problems involving ideal gas law and kinetic theory of gases
   44. The learner will be able to solve problems involving heat engine, second law of thermodynamics and entropy

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.