COURSE SYLLABUS

LAST REVIEW	Spring 2021
COURSE TITLE	Introductory Physics
COURSE NUMBER	NASC-0130
DIVISION	Math, Science, Business & Technology
DEPARTMENT	Physical Sciences
CIP CODE	24.0101
CREDIT HOURS	3
CONTACT HOURS/WEEK	Class: 3
PREREQUISITES	None
COURSE PLACEMENT	None

COURSE DESCRIPTION
This is a concept based course rather than mathematical emphasis. This course covers almost all areas of physics including mechanics, heat, fluids, oscillations, waves, sound, thermodynamic, electricity and magnetism, light and optics, and nuclear physics. This course can be useful for elementary level teachers and for students of non-science majors. Schedule: three hours of lectures per week.

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 course outline is indicated below and is subject to change as course development dictates.

I. The Study of Motion
   - A. Fundamental Physical Quantities
   - B. Speed & Velocity
   - C. Acceleration
   - D. Simple Types of Motion

II. Newton's Laws of Motion
   - A. Force
   - B. Newton's Frist Law of Motion
   - C. Newton's Second Law of Motion
   - D. Different Types of Motion
   - E. Newton's Third Law of Motion
   - F. The Law of Universal Gravitation
   - G. Tides

III. Energy & Conservation of Energy
   - A. Conservation Laws
   - B. Linear Momentum
   - C. Work
   - D. Mechanical Energy
   - E. Other Forms of Potential Energy
   - F. The Conservation of Energy
   - G. Collisions
   - H. Power
   - I. Rotation & Angular Momentum

IV. Physics of Matter
   - A. Matter: Phase & Form
   - B. Pressure
   - C. Density
   - E. Fluid Pressure & Gravity
   - F. Archimedes' Principle
   - G. Pascal's Principle
   - H. Bernoulli's Principle

V. Heat & Temperature
   - A. Temperature
   - B. Thermal Expansion

C. The First Law of Thermodynamics
D. Heat transfer
E. Specific Heat Capacity & Phase Transition
F Heat Engine & the Second Law of Thermodynamics

VI. Waves & Sounds
A. Types & Properties of Waves
B. Aspects of Wave Propagation
C. Sound
D. Production of Sound
E. Propagation of Sound
F. Perception of Sound

VII. Electricity
A. Electric Charge
B. Electric Force and Coulomb's Law
C. Electric Current
D. Electric Current & Ohm's Law
E. Power & Energy in Electric Circuits
F. AC and DC

VIII. Electromagnetism & EM Waves
A. Magnetism
B. Interaction between Electricity & Magnetism
C. Principle of Electromagnetism
D. Electromagnetic Waves
E. Blackbody Radiation
F. EM Waves & Earth's Atmosphere

IX. Optics
A. Light Waves
B. Plane Mirrors & Curved Mirrors
C. Reflection & Refraction
D. Lenses & Images
E. Dispersion & Color
F. Atmospheric Optics

X. Atomic Physics
A. The Quantum Hypothesis
B. Photoelectric Effects & Photons
C. Atomic Spectra
D. The Bohr Model of the Atom
E. Quantum Mechanics
F. Atomic Structure
G. X-Ray Spectra

XI. Nuclear Physics & Relativity
A. The Nucleus
B. Radio Activity
C. Half-Life

D. Artificial Nuclear Reactions
E. Nuclear Binding Energy
F. Nuclear Fission
G. Nuclear Fusion
H. Einstein Theory of Relativity

COURSE LEARNING OUTCOMES AND COMPETENCIES

Upon successful completion of this course, the student will:

A. Be able to demonstrate the conceptual understanding of motion
   1. The learner will be able to demonstrate the understanding of fundamental and derived physical quantities with examples.
   2. The learner will be able to differentiate speed and velocity with examples.
   3. The learner will be able to calculate acceleration of a moving object.
   4. The learner will be able to calculate centripetal acceleration of an object moving in curved path.
   5. The learner will be able to use kinematic equations to solve constant acceleration motion problems.
   6. The learner will be able plot graphs for constant acceleration kinematic motions.

B. Be able to demonstrate the knowledge of Newton's laws of motion.
   7. The learner will be able to explain the difference between Force, mass, and weight with examples.
   8. The learner will be able to explain Newton's first law and the law of inertia.
   9. The learner will be able to solve problems using Newton's second law.
   10. The leaner will be able to explain projectile motion without doing any math.
   11. The learner will be able to explain the concept of simple harmonic example.
   12. The learner will be able to solve problems involving free fall.
   13. The learner will be able find gravitational force between any two masses.
   14. The learner will be able to calculate velocity of a satellite in an orbit using an equation.

C. Be able to demonstrate the conceptual understanding of energy and conservation laws
   15. The learner will be able to calculate linear momentum of a mass.
   16. The learner will be able to solve 1 dimensional inelastic collision problems.
   17. The learner will be able to calculate kinetic energy lost during inelastic collisions.
   18. The learner will be to calculate work done and power by a constant force in a straight line.
   19. The learner will be able to solve motion problems using conservation of mechanical energy.
   20. The learner will be able to explain and calculate spring energy.
   21. The leaner will be able to understand the concept of angular momentum.

D. Be able to demonstrate the conceptual understanding of physics of matter & pressure.
   22. The learner will be able to understand different phases of a matter.
   23. The leaner will be able to explain pressure and gauge pressure.
   24. The learner will be able to explain mass density, weight density and specific gravity.
   25. The learner will be able to calculate force of buoyancy.
   26. The learner will be able to demonstrate Archimedes' Principle.
   27. The learner will be able to derive Pascal's formula and solve problems.
   28. The learner will be able to solve problems using equation of continuity.
   29. The learner will be able to demonstrate Bernoulli's Principle

E. Be able to demonstrate the conceptual understanding of temperature and heat
   30. The learner will be to explain the concepts of heat and temperature with examples.
   31. The learner will be able to understand thermal expansion of solids, liquids and gases.
   32. The learner will be able to use ideal gas law equation to solve simple problems.
   33. The learner will be able to explain the concept of internal energy.
   34. The learner will be able to explain the concept of first law of thermodynamics.
   35. The learner will be able to explain conduction, convection, and radiation with examples.
   36. The learner will be able to calculate specific heat capacity of a material.
   37. The learner will be able to Latent heat of fusion and latent heat of vaporization.
   38. The learner will be able to explain relative humidity and solve the related problems.
   39. The learner will be able to explain the concept of second law of thermodynamics and calculate Carnot efficiency just using equation.

F. Be able to demonstrate the conceptual understanding of waves and sound.
   40. The learner will be able to explain how wave is generated and the types of waves.
   41. The learner will be to define wavelength, frequency, and amplitude.
   42. The learner will be able to explain wave fronts and rays
   43. The learner will be able to explain reflection of wave
   44. The learner will be able to explain doppler effect.
   45. The learner will be able to diffraction and interference.
   46. The learner will be able to explain sound waves.
   47. The learner will be able to explain propagation of sound waves.
   48. The learner will be able to explain pitch, loudness, and tone quality.

G. Be able to demonstrate the conceptual understanding of electricity.
   49. The learner will be able to explain and demonstrate how charge is produced.
   50. The learner will be able to calculate Coulomb's force and electric field of a charge or system of point charges.
   51. The learner will be able to solve problems involving Ohm's law.
   52. The learner will be able to calculate current and voltage in simple ohmic circuit.
   53. The learner will be able to calculate power and electric energy consumed by an electric device.

H. Be able to demonstrate the conceptual understanding of electromagnetism & EM waves.
   54. The learner will be able to demonstrate the knowledge of magnetic materials and magnetic field.
   55. The learner will be able to make magnet and electromagnet.
   56. The learner will be able to explain the concept of electric motors.
   57. The learner will be able to explain the concept of Faraday's law and electric generators.
   58. The learner will be able to describe or illustrate the use of radioactive materials.
   59. The learner will be able to explain electromagnetic wave spectrum.
   60. The learner will be able to explain black body radiation laws.
   61. The learner will be able to acquire the knowledge of ozone layer and greenhouse effect.

I. Be able to demonstrate the conceptual understanding of optics.
   62. The learner will be able to explain ray and wave concept of light
   63. The learner will be able to explain reflection, refraction, total internal reflection, diffraction, interference, and polarization.
   64. The learner will be able to draw image formation in lenses
   65. The learner will be able to explain dispersion through prism
   66. The learner will be able to explain how rainbow is formed and the blue sky

J. Be able to demonstrate the conceptual understanding of atomic physics
   67. The learner will be able to explain the concept of quantized oscillator.
   68. The learner will be able to explain photoelectric effect.
   69. The learner will be able explain the concept of Bohr's model.
   70. The learner will be able to explain de Broglie's hypothesis.
   71. The learner will be able to explain atomic energy level and Pauli exclusion principle.
   72. The learner will be able explain how x-ray and laser are produced.

K. Be able to demonstrate the conceptual understanding of nuclear physics

73. The learner will be able to explain the concept of alpha, beta and gamma decay.
74. The learner will be able to explain half-life and radioactive dating.

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.