# **COURSE SYLLABUS**

LAST REVIEW	Spring 2021	
COURSE TITLE	General Physics II with Lab	
COURSE NUMBER	NASC-0232	
DIVISION	Math, Science, Business & Technology	
DEPARTMENT	Physical Sciences	
CIP CODE	24.0101	
CREDIT HOURS	5	
CONTACT HOURS/WEEK	Class: 3	Lab: 4
PREREQUISITES	NASC-0231, General Physics I with Lab	

COURSE PLACEMENT None

### **COURSE DESCRIPTION**

Physics II is the continuation of Physics I using the tools of algebra and trigonometry. Topics covered in this course will include electricity and magnetism, waves, optics, and an introduction to modern physics. Schedule: five hours of lectures and two hours of lab work per week. The course is currently being offered during spring semester only.

### KANSAS SYSTEMWIDE TRANSFER: PHY 2020/2021/2022

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.

### **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. Electric Forces & Fields
  - A. Electric Charge
  - B. Coulomb's Law
  - C. Electric Fields & Field Lines
  - D. Conductors in Electrostatic Equilibrium
  - E. Gauss's Law
- II. Electrical Energy & Capacitance
  - A. Electric Potential & Electric Potential Energy of Point Charge
  - B. Charge Conductors & Equipotential Surfaces
  - C. Capacitors
  - D. Combination of Capacitors
  - E. Energy in a Capacitor
  - D. Capacitors with Dielectrics
- III. Electric Current & Resistance
  - A. Electric Current
  - B. Drift Velocity
  - C. Electric Circuits
  - E. Resistance, Resistivity & Ohm's Law
  - G. Electric Energy & Power
- III. Direct-Current Circuits
  - A. Sources of emf
  - B. Resistors in Series & Parallel
  - C. Kirchhoff's Rules
  - D. RC Circuits
  - E. Household Circuits
- IV. Magnetism
  - A. Magnets & Magnetic Fields
  - B. Motion of a Charged Particle in Magnetic Field
  - C. Magnetic Force on a Current-Carrying Conductor
  - D. Magnetic Torque
  - E. Ampere's Law
  - F. Magnetic Force Between Current Carrying Conductors
  - G. Magnetic Fields of Current Loops and Solenoids
- V. Induced Voltage & Inductance
  - A. Magnetic Flux & Induced emf
  - B. Faraday's Law of Induction & Lena's Law
  - C. Motional emf
  - D. Generators
  - E. Self-inductance & Mutual Inductance
  - F. RL Circuits
  - G. Energy Stored in Magnetic Fields

- VI. Alternating Current Circuits & Electromagnetic Waves
  - A. Resistor, Inductor & Capacitor in AC Circuits
  - B. The RLC Series Circuits
  - C. Power in AC Circuits
  - D. Resonance in Series RLC Circuits
  - E. The Transformers
  - F. Maxwell's Equations
  - G. Antenna
  - I. Electromagnetic Waves Spectrum
  - J. Doppler Effects
- VII. Lights & Optics
  - A. Duel Nature of Light
  - B. Reflection & Refraction of Light
  - C. Law of Refraction
  - D. Dispersion & Prism
  - E. Huygens's Principle
  - F. Total Internal Reflection
- VIII. Mirrors & Lenses
  - A. Flat Mirrors
  - B. Image Formation by Spherical Mirrors
  - C. Images Formed by Refraction
  - D. Atmospheric Refraction
  - E. Lenses
- IX. Wave Optics
  - A. Interference
  - B. Young's Double-Slit Experiment
  - C. Reflection & Change of Phase
  - D. Interference in Thin Films
  - E. Diffraction & Single-Slit Diffraction
  - F. Diffraction Gratings
  - G. Polarization of Light Waves
- X. Quantum Mechanics
  - A. Blackbody Radiation & Plank's Hypothesis
  - B. Photoelectric Effect & Particle Theory of Light
  - C. X-Rays
  - D. Diffraction of X-Rays by Crystals
  - E. The Compton Effect
  - F. The Dual Nature of Light
  - G. The Wave Function
  - I. The Uncertainty Principle
- XI. Atomic Physics
  - A. Early Models of the Atom
  - B. Atomic Spectra
  - C. The Bohr Model

- D. Quantum Mechanics and the Hydrogen Atom
- E. The Exclusion Principle
- F. Characteristic X-Rays
- G. Atomic Transitions and Lasers
- XII. Nuclear Physics
  - A. Some Properties of Nuclei
  - B. Binding Energy
  - C. Radioactivity
  - D. The Decay Process
  - E. Natural Radioactivity
  - F. Nuclear Reaction

### COURSE LEARNING OUTCOMES AND COMPETENCIES

Upon successful completion of this course, the student will:

- A. Be able to demonstrate the knowledge of charge, Coulomb force, electric fields, and Gauss's Law
  - 1. The learner will be able to demonstrate the production of charge by conduction and induction method.
  - 2. The learner will be able to calculate electric field and electric force on a system of point charges.
  - 3. The learner will be able to find the electric flux and electric field using Gauss's Law
- B. Be able to demonstrate the knowledge of electrical energy and capacitance
  - 4. The leaner will be able to calculate electric potential of a point charge
  - 5. The learner will be able to calculate electric potential energy of a system of point charges.
  - 6. The learner will be able to relate electric potential and electric field.
  - 7. The learner will be able to solve problems involving electric potential energy and electrical work done.
  - 8. The learner will be able to solve problems related to series and parallel combination of capacitors.
  - 9. The learner will be able to explain the role of dielectric materials in a capacitor an solve related problems.
- C. Be able to demonstrate the knowledge of electric current resistance
  - 10. The learner will be able to explain microscopic view of current in a conductor and will be able to calculate drift velocity of electrons in a conductor.
  - 11. The learner will be able to verify ohms law in an ohmic circuit.
  - 12. The learner will be able to explain the concepts of ohmic and non-ohmic devices.
  - 13. The learner will be able to calculate power of in an electric circuit.

- D. Be able to demonstrate the knowledge of direct-current circuits.
  - 14. The learner will be able to solve problems involving series and parallel dc circuits.
  - 15. The learner will be able to solve complex dc circuit problems using Kirchhoff's law.
  - 16. The learner will be able to explain how a RC circuit works and solve problems related to RC circuits.
- E. Be able to demonstrate the knowledge of Magnetism
  - 17. The learner will be able to explain the basis of magnetic materials and magnet.
  - 18. The learner will be able to explain the properties of earth's magnetic field.
  - 19. The learner will be able to demonstrate the knowledge of how velocity selector and mass spectrometer works.
  - 20. The learner will be able to demonstrate the knowledge of electric motor.
  - 21. The learner will be able to calculate force between two parallel current carrying conductors.
  - 22. The learner will be able to solve problems involving solenoid and toroid.
  - 23. The learner will be able to calculate magnetic field using Ampere's law.
- F. Be able to demonstrate the knowledge of induced voltage and inductance
  - 24. The learner will be able to solve problems involving magnetic flux
  - 25. The learner will be able to solve problems based on Faraday's law
  - 26. The learner will be able to relate motional emf and Faraday's law.
  - 27. The learner will be able to solve problems involving generator.
  - 28. The learner will be able to calculate self and mutual inductance.
  - 29. The learner will be able to solve problems involving RL circuits.
- G. Be able to demonstrate the knowledge of AC circuits and Electromagnetic Waves.
  - 30. The learner will be able to explain phase difference between current and voltage when capacitor is connected with an AC circuit.
  - 31. The learner will be able to plot RLC phaser diagram for RLC series circuit.
  - 32. The leaner will be able to solve problems involving RLC series circuit.
  - 33. The learner will be able to solve problems related to power in AC circuits.
  - 34. The learner will be able to explain how transfers work.
  - 35. The learner will be able to explain how antenna emits electromagnetic waves.
  - 36. The learner will be able to explain the significance of Maxwell's equations.
  - 37. The learner will be able to explain electromagnetic wave spectrum.
- H. Be able to demonstrate the knowledge of Light and Optics
  - 38. The learner will be able to solve problems related to reflection and refraction.
  - 39. The learner will be able to explain the dispersion of light through prism.
  - 40 The learner will be able to explain how a double rainbow is formed.
  - 41. The learner will be able to explain law of refraction using Huygens' principle.

- 42. The learner will be able to solve problems involving critical angle and total internal reflection.
- I. The learner will be able to demonstrate the knowledge of Mirrors and Lens
  - 43. The learner will be able to solve problems involving image formation in flat and spherical mirrors.
  - 44. The learner will be able to solve problems involving image formation by refraction.
  - 45. The learner will be able to solve problems involving image formation by thin lenses.
  - 46. The learner will be able to demonstrate the knowledge of aberrations in mirror and lenses.
- J. Be able to demonstrate the knowledge of Wave Optics
  - 47. The learner will be able to explain the concept of interference.
  - 48. The learner will be able to derive equation for double slit interference.
  - 49. The learner will be able to derive equation for interference in thin films.
  - 50. The leaner will be able to explain the physics of diffraction.
  - 51. The learner will be able to solve problems involving diffraction in single slit.
  - 52. The leaner will be able explain the diffraction through diffraction grating.
  - 53. The learner will demonstrate the knowledge of polarization of light waves and derive equation for Brewster's Law.
- K. Be able to demonstrate the knowledge of Quantum Physics
  - 54. The leaner will be able to explain the difference between Wein's displacement law and Plank's law.
  - 55. The learner will be able explain the physics behind photoelectric effect with mathematical equation.
  - 56. The learner will be able to explain how the x-rays are produced.
  - 57. The learner will be able to derive Brag's law.
  - 58. The learner will be able to explain the Compton effect.
  - 59. The learner will demonstrate the knowledge of uncertainty principle.
- L. Be able to demonstrate the knowledge of Atomic Physics
  - 60. The learner will be able to explain atomic spectra.
  - 61. The learner will acquire the knowledge of the Bohr's model.
  - 62. The learner will be able to demonstrate the knowledge of hydrogen spectra.
  - 63. The learner will be able to explain Pauli's exclusion principle.
  - 64. The learner will be able to demonstrate the knowledge of atomic transition and lasers.
- M. Be able to demonstrate the knowledge of Nuclear Physics
  - 65. The leaner will be able to demonstrate the knowledge of nuclear structure and stability.

- 66. The learner will be able to calculate the binding energy.
- 67. The learner will be able to demonstrate the knowledge of radioactive decay.
- 68. The learner will be able to explain the process of alpha, beta, and gamma decay.
- 69. The learner will be able to solve problems involving carbon 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-ofconduct.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-supportservices/index.html.