

Physics Syllabus 2023-2024

Kingdom International School

Teacher: **Alexander Faulk**

Email: af_1132@yahoo.com

Textbook: *Physics*, 6th Ed. Douglas Giancoli

[Access the textbook via this link \(text is too large of a file to preview, please download to your device\)](#)

Course Description:

Physics is the study of matter, energy, and how they are related in a manner more fundamental than in previous science courses. Through the various mathematical and physical topics instructed, students will generate a deeper understanding of the laws that govern the various aspects of our universe. Furthermore, students receive exposure to different philosophical viewpoints regarding the beginning and creation of the universe, in order to show the complexity and interweaving that point directly to God, the Divine Creator.

Biblical Focus:

Physics, like all other studies, should point directly to God, His Creation, and His Glory over all the earth.

“The heavens declare the glory of God; the skies proclaim the work of his hands. Day after day they pour forth speech; night after night they display knowledge. There is no speech or language where their voice is not heard. Their voice goes out into all the earth, their words to the ends of the world.” (Psalm 19:1-4, NIV)

Course Objectives:

Upon Completion of this course, the students will be able to do the following:

1. Understand, create, and convert between different measurements, and correctly utilize the process of estimation
2. Understand the scope of and use of vectors in one dimensional kinematics, and compute quantities such as displacement, velocity, and acceleration.
3. Understand the scope and use of vectors in two dimensional kinematics, and compute quantities such as displacement, velocity, and acceleration in both vertical and horizontal components.
4. Understand the scope and use of vectors in two-dimensional vectors in Newtonian dynamics, using Newton's Laws of Motion to compute forces and components of forces.
5. Investigate and understand specific types of motion in Newtonian dynamics, focusing on uniform circular motion and motion due to Newton's Universal Law of Gravitation.
6. Understand the nature of energy and its conservation, work, and their relation to forces, computing exchanges between types of energy and the resulting changes in motion.
7. Understanding and computing momentum and its conservation, impulse, and determining motion changes due to a variety of types of collisions.
8. Understand rotational reference frames, and compute the angular analogies to linear quantities involved in rotational motion.
9. Understand and compute energy transfers within simple harmonic motion, define waves, and understand the basic properties of waves.
10. Define the quantity of electric charge, understand the interactions between charges through Coulomb's Law, and understand energy exchange between charges through electric potential differences.

11. Understand the properties of direct current and the basic concepts of alternating current, and compute resistances, currents, and voltages in basic circuits.
12. Understand the concepts of magnetism, its relation to the laws governing moving charges, and the phenomenon of electromagnetic induction.
13. Understand the wave nature of light through the models of electromagnetic waves and rays, computing and diagraming measurements involving light ray reflection and refraction.
14. Understand the physics of sound and its various wave forms, computing quantities involved in the different categories of sound producers and modifications to sound waves due to interactions and moving sources/receivers.
15. Understand and interpret the Zeroth, First, Second, and Third Laws of Thermodynamics, and investigate the conservation of energy through heat transfer in various types of heat engines.
16. Understand the properties of both static and flowing fluids, analyzing buoyancy, pressure, density, and fluid flow speeds.
17. Discover and understand the early facets of 20th century quantum mechanics as well as the basic physics of stars and other cosmic phenomena.

Course Topics and Assignments:

Unit 1: What is Physics? - Measurements, Units, and Elementary Problem Solving
Unit 2: Kinematics in One Dimension - Studying motion in one dimension, position, velocity, acceleration, gravity, vectors, and graphing
Unit 3: Kinematics in Two Dimensions - Studying motion in two dimensions, 2-D vectors, projectile motion
Unit 4: Forces and the Laws of Motion - Introduction to forces and force vectors, Newton's Laws of Motion, problems
Units 5: Circular Motion and Gravitation - Centripetal acceleration and forces, uniform circular motion, Newton's Law of Gravitation
Unit 6: Work and Energy - Introduction to Work, conservative and non-conservative forces, energy, energy conservation
Unit 7: Linear Momentum - Introduction to linear momentum, impulse, momentum conservation, and collision types
Unit 8: Rotational Motion - Angular analogies to linear motion quantities, torque, angular momentum and its conservation
First Semester Exam: 50 question multiple choice test taken in an online proctored setting
Unit 9: Vibrations and Waves - Wave pulses and Standing Waves, Wave Interference, wave properties, Energy stored in waves
Unit 10: Electricity: Charges and Fields - Introduction to Electric Charge, Electrostatic Forces, Electric Fields, Electric Potential
Unit 11: Electricity: Circuits - Introduction to Electric voltage, resistance, current, power, and circuits, Kirchhoff's Laws
Unit 12: Magnetism - Introduction to magnets, magnetic fields, forces on moving electric charges, Magnetic Flux, Electromagnetic Induction
Unit 13: Light and Optics - Introduction to Light waves, reflection, refraction, diffraction, mirrors and lenses, magnification, and image creation
Unit 14: Sound - Introduction to Sound Waves, speed of sound, harmonics, overtones, the Doppler Effect
Unit 15: Thermodynamics - Temperature, Heat, Heat Flows, Equilibrium, Engines and Heat Pumps, Thermodynamic Processes, Laws of Thermodynamics

Unit 16: Fluids

- Introduction to Fluids, buoyancy, hydrostatic pressure, density, Archimedes' Principle, Pascal's Principle, Equation of Continuity, Bernoulli's Equations

Unit 17: Introduction to Modern Physics

- Special Relativity, Blackbody Radiation, Introduction to Quantum Mechanics, Astrophysics

Second Semester Exam: 50 question multiple choice test taken in an online proctored setting

Recorded Course Required Materials:

- Access to Textbook
- Scientific or Graphing Calculator: TI-21 Multiview, TI-30XS Multiview, TI-83Plus, TI-84Plus
- Paper to take notes
- Pencils to write
- Reliable internet connection

Recorded Course Rules:

- Be professional and an ambassador of Christ in your communication with the teacher
- Course content is the intellectual property of the teacher and Kingdom International School. Absolutely no copying and disseminating of course materials to others not enrolled your course will be tolerated.
- Absolutely no cheating of any kind will be tolerated

Recorded Course Evaluation:

60%: Course Attendance

40%: Semester Exams (20% Each)

Tips for Success:

Success in this course relies entirely on your effort and drive to succeed and finish the race. Please pace yourself with one lesson a day during the school week, and always attempt all the recommended practice questions. If you are struggling, please contact me, Alexander Faulk, at af_1132@yahoo.com so that I may assist you.