

# PHYSICS (PHYS)

This is a list of the Physics (PHYS) courses available at KPU.

## **PHYS 1100** **4 Credits**

### **Introductory Physics**

Students in this survey course will study kinematics and dynamics in one and two dimensions, energy and momentum conservation, electricity and magnetism, waves, and geometric optics. In the lab students will also study basic techniques of measurement, including the use of computers and report writing.

Note: This is a preparatory course for students who have not passed Principles of Physics 12.

*Prerequisites: Prerequisites: (MATQ 1093 or MATH 1117) or (MATQ 1099 or MATQ 0011 or ABEM 0011 or MATP 1011 or MATQ 1099 with a B-) or Pre-calculus 12 with a C; or Principles of Mathematics 12 with a C; or Pre-calculus 11 with a B; or Principles of Mathematics 11 with a B; or Pre-calculus 11 with a C plus Mathematics Placement Test; or Principles of Mathematics 11 with a C plus Mathematics Placement Test; or Pre-calculus 12 with a C- plus Mathematics Placement Test; or Principles of Mathematics 12 with a C- plus Mathematics Placement Test; or Applications of Mathematics 12 with a C plus Mathematics Placement Test; or Applications of Mathematics 11 with a C plus Mathematics Placement Test; or {Foundations of Mathematics 12 with a C AND [PHYQ 1098 or Physics 11 with a C]}*

*Attributes: QUAN*

*Transferable (refer to transfer guide)*

## **PHYS 1101** **4 Credits**

### **Physics for Life Sciences I**

Students will study work, energy, power, efficiency, and heat; kinematics and dynamics of rotation; fluids; oscillations, waves, and sound. Students will study relevant examples and applications of each course topic in the areas of medical and life sciences. Students will participate in laboratory activities that emphasize data collection and analysis.

*Prerequisites: PHYS 1100 or Principles of Physics 12 (with a P)*  
*Co-requisites: MATH 1120 or 1130 or 1140 MATH 1120 or 1130 or 1140*

*Attributes: QUAN*

*Transferable (refer to transfer guide)*

## **PHYS 1102** **4 Credits**

### **Physics for Life Sciences II**

Students will learn about optics and optical instruments; electrostatic forces and fields; magnetic forces and fields; electromagnetic induction; electric circuits; atomic structure, nuclear physics and radioactivity. Students will study relevant examples and applications of each course topic in the areas of medical and life sciences. Students will participate in laboratory activities that will emphasize data collection and analysis.

*Prerequisites: PHYS 1101 or PHYS 1120*  
*Co-requisites: MATH 1220 or 1230 or 1240 MATH 1220 or 1230 or 1240*

*Attributes: QUAN*

*Transferable (refer to transfer guide)*

## **PHYS 1112** **3 Credits**

### **Reel Physics**

Students will study a wide range of physical concepts in the context of popular culture. They will investigate the often-incorrect portrayal of basic physics in varied source material (movies, television, and print media). Students will critically view source materials and determine when the physics has been correctly or incorrectly portrayed.

NOTE: This is an introductory course in physics intended for students not specializing in science or applied science, but will utilize basic arithmetic skills. No prior study of physics is required.

*Attributes: QUAN*

*Transferable (refer to transfer guide)*

## **PHYS 1120** **4 Credits**

### **Physics for Physical and Applied Sciences I**

Students will learn about statics, dynamics, oscillations, mechanical waves and sound. They will use computers extensively in the lab for data collection and analysis.

*Prerequisites: PHYS 1100 or Principles of Physics 12 (with a C)*

*Co-requisites: MATH 1120 or 1130 MATH 1120 or 1130*

*Attributes: QUAN*

*Transferable (refer to transfer guide)*

## **PHYS 1170** **3 Credits**

### **Mechanics I**

Students will study the statics, kinematics and dynamics of particles and rigid bodies. They will apply vector analysis to three-dimensional static-equilibrium problems, and differential and integral calculus to dynamics problems, as well as make use of Newton's laws and the concepts of impulse, momentum, work and energy. Students will focus on the analysis of practical mechanics problems in two and three dimensions.

Note: This is an Applied Science (Engineering) course.

*Prerequisites: PHYS 1120*

*Co-requisites: MATH 1220 MATH 1220*

*Attributes: QUAN*

*Transferable (refer to transfer guide)*

## **PHYS 1220** **4 Credits**

### **Physics for Physical and Applied Sciences II**

Students will learn about optics, modern physics, electricity and magnetism. They will use computers extensively in the lab for data collection and analysis.

Note: Students who intend to go on in the physical or applied sciences must take MATH 1220 to ensure transfer credit

*Prerequisites: PHYS 1120 or 1101*

*Co-requisites: MATH 1220 or 1230 MATH 1220 or 1230*

*Attributes: QUAN*

*Transferable (refer to transfer guide)*

**PHYS 1400** **3 Credits**  
**Energy, Environment, Physics**

Students will learn the basic principles of environmental physics. Students will build, analyze, and critique physical models of environmental processes. Students will apply environmental physics concepts to topical problems such as consumer energy use, renewable energy resources, carbon footprint, water use, waste, and global warming.

*Prerequisites: (Principles of Math 11 with a C+) or (Pre-calculus 11 with a C+) or (Foundations of Math 11 with a C+) or (Principles of Math 12 with a C) or (Pre-calculus 12 with a C) or (Foundations of Math 12 with a C) or MATH 1117*  
*Transferable (refer to transfer guide)*

**PHYS 1401** **1 Credits**  
**Environmental Physics Lab**

Students will conduct laboratory investigations related to environmental physics concepts such as: energy use, electrical power generation, fluid statics and dynamics. Students will use computers to obtain and analyze data, and to write reports.

*Prerequisites: (Principles of Math 11 with a C+) or (Pre-calculus 11 with a C+) or (Foundations of Math 11 with a C+) or (Principles of Math 12 with a C) or (Pre-calculus 12 with a C) or (Foundations of Math 12 with a C) or MATH 1117*  
*Transferable (refer to transfer guide)*

**PHYS 1600** **3 Credits**  
**Introduction to Modern Technology**

Students will learn to work with microcontroller chips which are at the heart of many modern technological devices. Students will program a microcontroller to develop a device (e.g. a calculator or a simple robot) to function as intended. Students will learn the basics of the C programming language as well as skills such as simple circuit design, data acquisition, digital input and output (DIO), analog-to-digital conversion (ADC), pulse width modulation (PWM), and timing.

*Prerequisites: PHYS 1100 or Principles of Physics 12 (with a C)*  
*Transferable (refer to transfer guide)*

**PHYS 2010** **3 Credits**  
**Modern Physics**

Students will study the basic postulates and results of the Special Theory of Relativity and Quantum Mechanics. Students will review the experimental evidence for quantization. Students will use the Schrödinger Equation to obtain wavefunctions for a variety of situations, including the Hydrogen atom. Students will also be introduced to solid state physics with an emphasis on electronic devices.

*Prerequisites: (PHYS 1102 or PHYS 1220) and (MATH 1220 or 1230)*  
*Transferable (refer to transfer guide)*

**PHYS 2030** **3 Credits**  
**Classical Mechanics**

Students will study intermediate topics in Classical Mechanics that rely heavily on mathematical skills developed in introductory calculus courses. Students will study topics such as time, position and velocity dependent forces, damped and forced vibrations, inertial and non-inertial frames of reference, the Kepler problem, and fluid mechanics. Students will extend the concepts learned in PHYS 1120.

*Prerequisites: PHYS 1120 or (PHYS 1101 with a B)*  
*Co-requisites: MATH 1152 or MATH 2321 or MATH 2821*  
*Transferable (refer to transfer guide)*

**PHYS 2040** **3 Credits**  
**Thermal Physics**

Students will learn about the thermal properties of matter, and mechanisms of heat transfer. Students will study heat engines and refrigeration, phase changes, and the laws of thermodynamics. Students will also study environmental applications of thermal physics and applications in green energy technology.

*Prerequisites: (PHYS 1102 or PHYS 1220) and (MATH 1220 or MATH 1230)*  
*Transferable (refer to transfer guide)*

**PHYS 2100** **3 Credits**  
**Experimental Physics**

Students will learn how physical and statistical principles are applied in designing experiments and analyzing their results. They will use analogue and digital electronics, electronic instrumentation, and computers in the acquisition of experimental data. Students will perform experiments in classical mechanics, fluid dynamics, optics, thermodynamics, electronics, and/or modern physics.

*Prerequisites: (PHYS 1102 or PHYS 1220) and (MATH 1220 or MATH 1230)*  
*Transferable (refer to transfer guide)*

**PHYS 2330** **3 Credits**  
**Intermediate Mechanics**

This course extends the concepts covered in PHYS 1120. Students will study the general motion of particles and rigid bodies, inertial and non-inertial frames of reference, the harmonic oscillator, and central forces.

*Prerequisites: PHYS 1120 or (PHYS 1101 with a B or better)*  
*Co-requisites: MATH 2321 MATH 2321*  
*Attributes: QUAN*  
*Transferable (refer to transfer guide)*

**PHYS 2420** **3 Credits**  
**Intermediate Electricity and Magnetism**

Students will learn the principles of electricity and magnetism at an intermediate level. Topics covered are: electrostatic forces and fields, electric potential, capacitance and dielectrics, DC and AC circuits, magnetic fields, magnetic properties of materials, an introduction to semiconductor devices and Maxwell's equations.

*Prerequisites: (PHYS 1220 or PHYS 1102) and (MATH 1220 or MATH 1230)*  
*Co-requisites: MATH 2321 or MATH 2721 or MATH 1152 MATH 2321 or MATH 2721 or MATH 1152*  
*Attributes: QUAN*  
*Transferable (refer to transfer guide)*

**PHYS 2600** **3 Credits**  
**Electronics**

Students will learn about direct current (DC) and alternating current (AC) circuits. Students will build, and study the behaviour of circuits containing resistors, capacitors, inductors, diodes, operational amplifiers, and transistors. Students will work with programmable microcontrollers using the C language to utilize microcontroller fundamentals such as digital input and output (DIO), analog-to-digital conversion (ADC), and timing to apply them to circuit design and data acquisition.

*Prerequisites: PHYS 1220 and (PHYS 1600 or APSC 1299) and MATH 1220*  
*Not Transferable*

**PHYS 2610** **3 Credits**  
**Sensors and Actuators**

Students will be introduced to components of measurement systems using a variety of sensors, with emphasis on the practical use of associated signal measurement equipment. Students will also learn the theory of operation of sensors, actuators, and transducers and use these components to build working systems.

*Prerequisites: (PHYS 1600 or APSC 1299) and PHYS 2100*  
*Transferable (refer to transfer guide)*

**PHYS 3202** **3 Credits**  
**Biophysics**

Students will study the biomechanics of the skeletal system, the strength of materials as it applies to the human body, the fluid dynamics of the circulatory system, diffusion and Brownian motion, thermoregulation of the body, the optics and neurophysics of vision, the acoustics of the ear and the human voice, electrical models of nerve conduction, and radiation dosimetry.

*Prerequisites: (PHYS 1101 or 1120) and (MATH 1120 or 1130)*  
*Note: PHYS 1220 is recommended*  
*Co-requisites: BIOL 1210 BIOL 1210*  
*Attributes: QUAN*  
*Transferable (refer to transfer guide)*

**PHYS 3700** **3 Credits**  
**Signal and Image Processing**

Students will learn about the noise characteristics of components, sensors, and systems, as well as signal recovery techniques. They will also learn about the acquisition, processing and analysis of images for scientific and industrial applications. Students will develop and work with instrumentation and software for signal and image processing in the laboratory. Students will apply statistical analysis throughout, both for theory and for analysis.

*Prerequisites: PHYS 2420 AND PHYS 2610*

**PHYS 3950** **3 Credits**  
**Work Experience - Part I**

Students will apply their previous learning to a real world situation during a work experience term that has been approved by, and with supervision from, Physics faculty. Students will prepare a plan of the work to be performed. Students will work full-time for seven weeks and will write a report at the end of that period.

*Prerequisites: Approval of Physics work experience committee AND completion of at least 9 PHYS credits at the 3000 level.*  
*Not Transferable*

**PHYS 3951** **3 Credits**  
**Work Experience - Part II**

Students will continue to apply their previous learning to a real world situation during a work experience term that has been approved by, and with supervision from, Physics faculty. Students will work full-time for at least seven weeks and will prepare a final report and a presentation at the conclusion of the placement. Students will use the report and presentation to demonstrate the understanding they have gained of the applicability and relevance of their studies to modern technology.

*Prerequisites: Approval of Physics work experience committee AND completion of at least 9 PHYS credits at the 3000 level*  
*Not Transferable*