

# PHYSICS (PHYS)

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

## PHYS 1100 CR-4

### 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: (MATQ 1093 or MATH 1117) 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 P plus Mathematics Placement Test; or Principles of Mathematics 12 with a P 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]}*

*Co-requisites: NOTE: Those planning to take further physics courses beyond PHYS 1100 should be aware that the minimum math requirements for those courses are higher than those for PHYS 1100. Students should investigate these as soon as possible to avoid future delays. NOTE: Those planning to take further physics courses beyond PHYS 1100 should be aware that the minimum math requirements for those courses are higher than those for PHYS 1100. Students should investigate these as soon as possible to avoid future delays.*

*Transferable (refer to transfer guide)*

## PHYS 1101 CR-4

### 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*

*Transferable (refer to transfer guide)*

## PHYS 1102 CR-4

### 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*

*Transferable (refer to transfer guide)*

## PHYS 1112 CR-3

### 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.

*Transferable (refer to transfer guide)*

## PHYS 1120 CR-4

### 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*

*Transferable (refer to transfer guide)*

## PHYS 1170 CR-3

### 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*

*Transferable (refer to transfer guide)*

## PHYS 1220 CR-4

### 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*

*Transferable (refer to transfer guide)*

## PHYS 1400 CR-3

### 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 CR-1****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 CR-3****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 CR-3****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 1220) and (MATH 1220 or 1230)*  
*Co-requisites: MATH 2721 MATH 2721*  
*Transferable (refer to transfer guide)*

**PHYS 2030 CR-3****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 2821 MATH 2821*  
*Transferable (refer to transfer guide)*

**PHYS 2040 CR-3****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 CR-3****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 2101 CR-2.5****Experimental Physics I**

Students will learn how physical principles are applied in designing experiments and analyzing their results. They will learn the electronic skills necessary to work in a modern physics laboratory. Students will perform experiments in basic analogue and digital electronics, learn the use of standard electronic instrumentation, and use the computer for data analysis.

*Prerequisites: PHYS 1220*  
*Co-requisites: MATH 2321 or 2232 or 2233*  
*Transferable (refer to transfer guide)*

**PHYS 2201 CR-2.5****Experimental Physics II**

Students will learn how physical 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 thermodynamics, electronics, and modern physics, and will use computers in modelling, data analysis, and in writing reports.

*Prerequisites: PHYS 2101*  
*Transferable (refer to transfer guide)*

**PHYS 2330 CR-3****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*  
*Transferable (refer to transfer guide)*

**PHYS 2420 CR-3****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, and introduction to semi-conductor devices and Maxwell's equations.

*Prerequisites: PHYS 1220 or (1102 with a B or better)*  
*Co-requisites: MATH 2321 (MATH 3322 is strongly recommended) MATH 2321 (MATH 3322 is strongly recommended)*  
*Transferable (refer to transfer guide)*

## **PHYS 2421 CR-2**

### **Laboratory in Electric Circuits**

Students will learn about: measuring voltage, frequency and phase angle using an oscilloscope; charging and discharging of a capacitor; RC, RL and LCR circuits; resonance and oscillations; rectification and filter circuits; transistor characteristics and amplification; and operational amplifiers.

*Prerequisites: PHYS 1220 or (1102 with a B or better.)*

*Co-requisites: MATH 2321 and PHYS 2420*

*Transferable (refer to transfer guide)*

## **PHYS 2424 CR-3**

### **Relativity and Quanta**

Students will study special relativity and quantum physics at an intermediate level. They will examine aspects and applications of Lorentz transformation, dynamics and conservation laws. Students will also review the experimental evidence for quantization and conduct a qualitative discussion of quantum mechanics and their application to simple systems of atoms and nuclei.

*Prerequisites: (PHYS 1102 or 1220) and (MATH 1220 or 1230)*

## **PHYS 2600 CR-3**

### **Electronics with Microcontrollers**

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*

*Co-requisites: PHYS 2610 PHYS 2610*

*Not Transferable*

## **PHYS 2610 CR-3**

### **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*

*Co-requisites: PHYS 2600 PHYS 2600*

*Transferable (refer to transfer guide)*

## **PHYS 3202 CR-3**

### **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*

*Transferable (refer to transfer guide)*