

PHYSICAL AND LIFE SCIENCES (PHYL)

The courses listed on this page are exclusive to the LPS BAAS degree (<https://lpsonline.sas.upenn.edu/features/what-bachelor-applied-arts-and-sciences-degree/>) and LPS Online certificates (<https://lpsonline.sas.upenn.edu/academics/certificates/>).

PHYL 1200 Foundations of Life Sciences

Foundations of Life Sciences is a required course for students in the physical and life sciences concentration that also fulfills the Scientific Process foundational course requirement for those in other concentrations who are seeking a BAAS degree. This course will serve as an introduction to the life sciences and is concerned with the relationship of structure to function, the mechanisms underlying energy capture and retrieval, information storage and flow, and the regulation and coordination of these core activities in living systems with an eye to their evolutionary origins. In this course, students will gain exposure to topics such as metabolism, membrane transport, genetics, physiology and ecology. Each of the topics covered will involve an interactive lecture component, a discussion board prompt, a problem set, an activity centered on the scientific method, and a reading comprehension quiz. Note that this course is designed for students with a range of quantitative reasoning skills and those who have had no prior exposure to college-level science. Anyone who is interested in knowing more about the study of living things and in delving into how they do what they do is encouraged to take this course!

1 Course Unit

PHYL 1600 Foundations of Physical & Chemical Sciences

How do the microscopic particles and invisible forces interact to form the world we experience daily? This course serves as a college-level introduction to the physical and chemical sciences and uses an algebra-based approach to solving word problems in these disciplines. PHYL1600 will introduce students to how microscopic particles and their properties, motions and behaviors manifest in macroscopic realities. In this course, students gain exposure to topics in physics such as motion, force, energy, heat and electromagnetism. Students will also be introduced to the topics in chemistry of the periodic table, properties of molecules, chemical reactions and phases of matter. The rules that govern energy and matter transformations will be explored. Students will discover examples of how the physical laws of the universe apply to everyday realities like cooking, energy consumption in homes, materials used in daily life, exercise, and star gazing. Note that algebra proficiency is a pre-requisite for this course and is not taught in the course directly.

PREREQUISITES: This course requires algebraic manipulations, graphical analysis, and unit conversions. Students should purchase a scientific calculator like Ti-30Xa before the course. Either MTHS2000 or MTHS1000 or another equivalent Foundational Requirement in Quantitative Reasoning is required as a pre-requisite to registering for PHYL1600.

Foundations of Physical and Chemical Sciences is a required course for students pursuing a BAAS degree with a concentration in Physical and Life Sciences. The course also fulfills the Scientific Process foundational course requirement for students in the BAAS program who are pursuing other concentrations.

1 Course Unit

PHYL 2100 Fundamental Chemical Principles

This course covers general and organic chemistry topics to build a strong foundation for more advanced chemistry or biology courses. Students will become familiar with oxidation-reduction, equilibria, reaction rates, acid-base reactions, and nuclear chemistry. The structures and reactions of alkyl halides, ketones, aldehydes, carboxylic acids, and carboxylic acid derivatives will also be introduced. Emphasis will be placed on the curved arrow mechanisms for each reaction. This course requires algebraic manipulations, graphical interpretation, and chemical problem solving and as such PHYL 1200/1600, PHYL 2100 and a Quantitative Reasoning course are all required pre-requisites.

1 Course Unit

PHYL 2200 Biochemistry – Chemical Principles of Living Systems

This course builds on the principles of general and organic chemistry discussed in PHYL 2100 to build an understanding of the molecules and chemical reactions of living organisms specifically. Students will become familiar with the structures and functions of nucleic acid, proteins, polysaccharides, triglycerides and phospholipids. The processes and pathways that synthesize, catabolize, and transfer the information in these biomolecules will be discussed in detail. Particular emphasis in some units will be placed on the enzymatic mechanisms that allow for rapid production of molecules needed for life at just the right moment. This course requires algebraic manipulations, graphical interpretation, and chemical problem solving and as such PHYL 1200/1600, PHYL 2100 and a Quantitative Reasoning course are all required pre-requisites.

1 Course Unit

PHYL 2300 Physics with Python Applications: Mechanics

An introductory, algebra-based physics course with emphasis on applications. Topics include kinematics in 1D and 2D, Newton's Laws, uniform circular motion, energy, momentum, rotation, and simple harmonic motion. Concurrently, students will be introduced to the basics of programming in Python and will be expected to apply their programming skills to the physics applications discussed. **Pre-requisite:** Requires basic knowledge of algebra, geometry, and trigonometry (functions and their graphs, linear and quadratic equations, exponents and logarithms, areas of planar shapes, Pythagorean theorem, right angle trigonometry, basic trigonometric functions), scientific notation and unit conversions. **Course Objectives** • Define fundamental laws and principles which govern and give meaning to our physical world. • Describe and explain physical phenomenon using discipline specific vocabulary. • Apply basic physical principles to solve problems and demonstrate the procedural knowledge necessary to arrive at a solution for some desired 'to finds' from the 'givens'. • Develop basic programming skills and techniques necessary to model or simulate a physical situation, analyze results, and make predictions.

1 Course Unit

PHYL 2400 Physics with Python Applications - Electromagnetism

An introductory, algebra-based physics course with emphasis on applications. Topics include electrostatics, current electricity, magnetism, electromagnetic induction, quantum mechanics, and nuclear physics.

Concurrently, students will be introduced to the basics of programming in Python and will be expected to apply their programming skills to the physics applications discussed. Pre-requisite: This course requires basic knowledge of algebra, geometry, and trigonometry (functions and their graphs, linear and quadratic equations, exponents and logarithms, areas of planar shapes, Pythagorean theorem, right angle trigonometry, basic trigonometric functions), scientific notation, and unit conversions.

Students must complete PHYL 2300 and any of its prerequisites (at least one Quantitative Reasoning course) before taking PHYL 2400. PHYL 1600 is strongly recommended Course Objectives • Define fundamental laws and principles which govern and give meaning to our physical world.

- Describe and explain physical phenomenon using discipline specific vocabulary.
- Apply basic physical principles to solve problems and demonstrate the procedural knowledge necessary to arrive at a solution for some desired 'to finds' from the 'givens'.
- Develop basic programming skills and techniques necessary to model or simulate a physical situation, analyze results, and make predictions.

Prerequisite: PHYL 1600 AND PHYL 2300

1 Course Unit