# Physics (PHYS)

## Courses

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<td>PHYS A101</td>
<td>Physics for Poets</td>
<td>3</td>
<td>Introduces liberal arts students to the theory, methods and techniques of physics, the most basic of the sciences. Provides broad exposure to many aspects of physics, including celestial mechanics, quantum theory, relativity, and cosmology, as well as the scientific method.</td>
<td>Does not fulfill the natural sciences component of the CAS B.S. degree.</td>
<td>Registration Restrictions</td>
<td>Natural Sciences GER</td>
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<tr>
<td>PHYS A115</td>
<td>Physical Science 3 Credits</td>
<td></td>
<td>Exposes students to basic concepts in physics. Presents general knowledge of science rather than an in-depth study of any one field.</td>
<td>Placement into MATH A105 or higher.</td>
<td>Registration Restrictions</td>
<td>Natural Sciences GER</td>
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<tr>
<td>PHYS A115L</td>
<td>Physical Science Lab 1 Credit</td>
<td>1</td>
<td>Introductory physics laboratory with experiments in mechanics, fluids and thermodynamics. Limited emphasis on historical development of physics.</td>
<td>High school trigonometry.</td>
<td>Registration Restrictions</td>
<td>Natural Sci Lab Only GER</td>
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<tr>
<td>PHYS A123</td>
<td>Basic Physics I 3 Credits</td>
<td></td>
<td>Non-calculus introduction to mechanics, fluids, and thermodynamics. Emphasizes motion, forces, gravitation, fluid motion, and laws of thermodynamics. Limited emphasis on historical development of physics.</td>
<td>MATH A105 with a minimum grade of C.</td>
<td>Registration Restrictions</td>
<td>Natural Sciences GER</td>
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<tr>
<td>PHYS A123L</td>
<td>Basic Physics I Laboratory 1 Credit</td>
<td>1</td>
<td>Introductory physics laboratory with experiments in mechanics, fluids and thermodynamics.</td>
<td>PHYS A123 with a minimum grade of C or concurrent enrollment.</td>
<td>Registration Restrictions</td>
<td>Natural Sci Lab Only GER</td>
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<tr>
<td>PHYS A123R</td>
<td>Basic Physics I Problem Solving 1 Credit</td>
<td></td>
<td>Techniques of problem solving for material covered in PHYS A123. Includes student discussion and presentation of solutions.</td>
<td>PHYS A123. Must have passed PHYS A123 with a minimum grade of C before taking this course.</td>
<td>Corequisites</td>
<td>A. A. A.</td>
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<tr>
<td>PHYS A124</td>
<td>Basic Physics II 3 Credits</td>
<td></td>
<td>Non-calculus introduction to electricity and magnetism, waves, optics, light, some modern and nuclear physics. Limited emphasis on historical development of physics.</td>
<td>PHYS A123 with a minimum grade of C.</td>
<td>Prerequisites</td>
<td>Natural Sciences GER</td>
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<tr>
<td>PHYS A124L</td>
<td>Basic Physics II Laboratory 1 Credit</td>
<td>1</td>
<td>Introductory physics laboratory with experiments in electricity and magnetism, waves, and optics.</td>
<td>PHYS A123 with a minimum grade of C and PHYS A123L with a minimum grade of C and PHYS A124 with a minimum grade of C or concurrent enrollment.</td>
<td>Attributes</td>
<td>Natural Sci Lab Only GER</td>
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<tr>
<td>PHYS A124R</td>
<td>Basic Physics II Problem Solving 1 Credit</td>
<td></td>
<td>Techniques of problem solving for material covered in PHYS A124. Includes student discussion and presentation of solutions.</td>
<td>PHYS A124. Must have passed PHYS A124 with a minimum grade of C before taking this course.</td>
<td>Corequisites</td>
<td>A. A. A.</td>
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<tr>
<td>PHYS A130</td>
<td>Survey of College Physics 3 Credits</td>
<td></td>
<td>Introduction to core principles of physics in classical mechanics, waves, electricity and magnetism, and optics. Specifically designed to prepare students for entry into calculus based physics.</td>
<td>MATH A152. Must have passed MATH A152 with a minimum grade of C before taking this course.</td>
<td>Prerequisites</td>
<td>Natural Sciences GER</td>
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<tr>
<td>PHYS A211</td>
<td>General Physics I 3 Credits</td>
<td></td>
<td>Calculus-based course covering classical mechanics (statics and dynamics of translational and rotational motion), fluids, elasticity, gravitation, oscillations and waves.</td>
<td>MATH A251 with a minimum grade of C and MATH A252 with a minimum grade of C or concurrent enrollment and (PHYS A130 with a minimum grade of C or UAA-Physics 211 Placement Exam with a score of 18).</td>
<td>Prerequisites</td>
<td>Natural Sciences GER</td>
</tr>
<tr>
<td>PHYS A211L</td>
<td>General Physics I Laboratory 1 Credit</td>
<td>1</td>
<td>Calculus-based introductory physics laboratory with experiments in computerized data collection and analysis, mechanics, waves, elasticity and wave motion.</td>
<td>PHYS A211 with a minimum grade of C or concurrent enrollment.</td>
<td>Registration Restrictions</td>
<td>Natural Sci Lab Only GER</td>
</tr>
<tr>
<td>PHYS A211R</td>
<td>General Physics I Problem Solving 1 Credit</td>
<td></td>
<td>Techniques of problem solving for material covered in PHYS A211. Includes student discussion and presentation of solutions.</td>
<td>PHYS A211. Must have passed PHYS A211 with a minimum grade of C before taking this course.</td>
<td>Special Note</td>
<td>A. A. A.</td>
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<tr>
<td>PHYS A212</td>
<td>General Physics II 3 Credits</td>
<td></td>
<td>Calculus-based course emphasizing basic electromagnetic theory, waves, fundamentals of geometric and physical optics, and light.</td>
<td>MATH A252 with a minimum grade of C and MATH A253 with a minimum grade of C or concurrent enrollment and PHYS A211 with a minimum grade of C.</td>
<td>Prerequisites</td>
<td>Natural Sciences GER</td>
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PHYS A212L. General Physics II Laboratory 1 Credit
Calculus-based introductory physics laboratory with experiments in electric and magnetic fields, geometric and physical optics, and light.
**Prerequisites:** PHYS A211 with a minimum grade of C and PHYS A211L with a minimum grade of C and PHYS A212 with a minimum grade of C or concurrent enrollment.
**Attributes:** UAA Natural Sci Lab Only GER.

PHYS A212R. General Physics II Problem Solving 1 Credit
Techniques of problem solving for material covered in PHYS A212. Includes student discussion and presentation of solutions.
**Special Note:** This course does not meet General Education Requirements.
**Corequisites:** PHYS A212.

PHYS A303. Modern Physics 3 Credits
Introduction to modern physics, primarily special relativity and quantum mechanics. Applications of these topics to the quantum structure of atoms, molecules, and solids; lasers; nuclear/particle physics and cosmology.
**Prerequisites:** MATH A302 with a minimum grade of C and PHYS A212 with a minimum grade of C.

PHYS A311. Intermediate Classical Mechanics 3 Credits
Newtonian, Lagrangian, and Hamiltonian mechanics, dynamics of systems of particles and rigid bodies.
**Prerequisites:** MATH A302 with a minimum grade of C and PHYS A212 with a minimum grade of C.

PHYS A314. Electromagnetics 3 Credits
Electromagnetic theory and applications. Static fields in free space and material media; steady current systems and associated magnetic effects. Includes magnetostatics, Maxwell's Equations, electromagnetic radiation, transmission lines and relativity.
**Crosslisted With:** EE A314.
**Prerequisites:** PHYS A212 and PHYS A212L and MATH A302.

PHYS A320. Simulation of Physical Systems 3 Credits
Introduces methods of computer simulation with diverse applications in physics such as numerical integration of Newton's equation, cellular automata, random walks, Monte Carlo methods, percolation and the dynamics of many body systems. No prior programming experience is required.
**Prerequisites:** MATH A252 with a minimum grade of C and PHYS A124 with a minimum grade of C or PHYS A212 with a minimum grade of C.

PHYS A324. Electromagnetics II 3 Credits
Use of Maxwell's equations in analysis of plane wave propagation, wave reflection, radiation and antennas, waveguides, cavity resonators, transmission lines, and radio propagation.
**Crosslisted With:** EE A324.
**Prerequisites:** (EE A314 or PHYS A314) and MATH A302.

PHYS A362. Optics 4 Credits
Interaction of light with matter: theory of geometric and nonlinear optics, Fourier optics, coherence theory, lasers, and additional topics of interest. Practical experience with relevant theories through laboratory projects including investigation of diffraction, interference and polarization. Design and construction of a telescope, a microscope and an interferometer.
**Prerequisites:** PHYS A212 with a minimum grade of C and PHYS A212L with a minimum grade of C.

PHYS A381. Advanced Physics Laboratory 3 Credits
Theory and practical application of topics in upper-division physics, using advanced laboratory experiments and techniques with statistical and error analysis of data.
**Prerequisites:** PHYS A303 with a minimum grade of C or concurrent enrollment.

PHYS A403. Quantum Mechanics 4 Credits
Fundamentals of quantum mechanics including applications to the hydrogen atom, particle spin and perturbation theory.
**Special Note:** Not available for credit to students who have completed PHYS A603.
**May Be Stacked With:** PHYS A603
**Prerequisites:** (CHEM A332 with a minimum grade of C or PHYS A303 with a minimum grade of C) and MATH A314 with a minimum grade of C.

PHYS A413. Statistical and Thermal Physics 4 Credits
Principles of applications of statistical mechanics and thermodynamics.
**Special Note:** Not available for credit to students who have completed PHYS A613.
**May Be Stacked With:** PHYS A613

PHYS A456. Nonlinear Dynamics and Chaos 3 Credits
An introduction to nonlinear dynamics and chaos. Concrete examples from physics, biology, chemistry, and engineering are used to develop analytical methods and geometric intuition. Topics covered include phase plane analysis, iterated maps, fractals, and strange attractors.
**Registration Restrictions:** Completion of GER Tier 1 (basic college-level skills) courses and junior standing.
**Crosslisted With:** BIOL A456 and CHEM A456
**Prerequisites:** MATH A253 with a minimum grade of C and (PHYS A124 with a minimum grade of C or PHYS A212 with a minimum grade of C).

PHYS A603. Research Projects 1-6 Credits
Individual research projects to be arranged with individual faculty members who will direct the research program.
**Special Note:** May be repeated for a maximum of 6 credits.
**Registration Restrictions:** Department permission.
PHYS A603 Advanced Quantum Mechanics 4 Credits
Mathematical foundations of quantum mechanics and advanced applications to the hydrogen atom, particle spin and perturbation theory. Includes review of current literature and/or independent research on the topic.
Special Note: Not available for credit to students who have completed PHYS A403.
Registration Restrictions: Graduate standing and approval of faculty advisor.
May Be Stacked With: PHYS A403

PHYS A613 Advanced Statistical and Thermal Physics 4 Credits
Principles and advanced applications of statistical mechanics and thermodynamics. Include review of current literature and/or independent research on the topic.
Special Note: Not available for credit to students who have completed PHYS A413.
Registration Restrictions: Graduate standing and approval of faculty advisor.
May Be Stacked With: PHYS A413

PHYS A690 Advanced Special Topics in Physics 1-4 Credits
Detailed study of a selected topic in physics at the graduate level. Includes review of current literature and/or independent research on the topic.
Special Note: May be repeated with change of topic for a maximum of 12 credits. Not available for credit to students who have completed PHYS A490 with the same topic.
Registration Restrictions: Graduate standing and approval of faculty advisor.
May Be Stacked With: PHYS A490

PHYS A698 Graduate Individual Research 1-6 Credits
Research projects to be arranged with individual faculty members who will direct the research program.
Special Note: May repeated for a maximum of 12 credits.
Registration Restrictions: Graduate standing and approval of faculty advisor

PHYS A699 Thesis 1-6 Credits
Planning, preparation and completion of a master's-level thesis.
Special Note: May repeated for a maximum of 12 credits.
Registration Restrictions: Graduate standing and approval of faculty advisor