

Physics

Physics Degrees and Certificates

Physics, Associate in Science

This degree is focused on providing students with the resources to pursue a baccalaureate degree in physics and establish a strong foundation for physics careers in academia or industry. This foundation will comprise the first two years of a baccalaureate degree in Physics. As physics is the fundamental basis for all other sciences, the program is versatile in that it may be applied to many science career paths (e.g., data science, cybersecurity, national security, software engineering, game engines, coding, and modelling). The Physics program further demonstrates its versatility by allowing the student to pursue coursework in other scientific area such as Biology, Chemistry, and Computer Science. The degree will be useful to students who are motivated towards an academic or industry career in physics as well as students who are sure of their penchant for science but unsure of precisely which field of science to commit to as a profession.

For additional program information, contact faculty advisor, Dr. Francis Toriello, at (609) 343-5682 or ftoriell@atlanticcape.edu, or department chair, Kenneth Cabarle at (609)343-5128 or kcabarle@atlanticcape.edu.

Upon completion of this program students will be able to:

- Use physics terminology, apply fundamental physical principles and the laws of physics to understand the relationship between matter and energy of physical systems and physical phenomenon exhibited by said physical systems;
- Apply both conceptual reasoning and quantitative skills to analyze and solve physics problems systematically and logically;
- Prepare for and safely conduct an experiment, properly record and analyze data, and apply theoretical strategies to the analysis of data and discuss the causes of error with respect to both theory and experiment;
- Use equipment, instrumentation, or other appropriate technology for data acquisition and analysis;
- Build and execute predicative mathematical models of physical systems;
- Effectively communicate scientific information and experimental results in written formats.

(PHYS-Fall 2023)

General Education Courses

When a course is not specified, refer to the list of approved General Education courses.

Communication

| Course # | Title | Credits |
|----------|----------------|---------|
| ENGL101 | Composition I | 3 |
| ENGL102 | Composition II | 3 |

Mathematics-Science-Technology

| Course # | Title | Credits |
|----------|-------------------|---------|
| MATH155 | Calculus I | 4 |
| MATH156 | Calculus II | 4 |
| PHYS225 | General Physics I | 4 |

Social Science

| Course # | Title | Credits |
|----------|---|---------|
| | General Education Social Science Course (3 credits) | 3 |

Humanities

| Course # | Title | Credits |
|----------|---|---------|
| | Choose: ARTS103, ARTS108, ARTS109, ARTS115, DANC170, MUSC100 or THEA110 (3 credits) | 3 |
| | Choose: PHIL101, PHIL102, PHIL105, PHIL110 or PHIL111 (3 credits) | 3 |

Humanities or Social Science

| Course # | Title | Credits |
|----------|---|---------|
| | General Education Social Science or Humanities Course (3 credits) | 3 |

Program Requirements

| Course # | Title | Credits |
|----------|--------------------------------|---------|
| MATH255 | Calculus III | 4 |
| MATH256 | Differential Equations | 4 |
| PHYS226 | General Physics II | 4 |
| PHYS228 | General Physics III | 4 |
| PHYS230 | Introduction to Modern Physics | 4 |

Program Electives

Choose a minimum of 10 credits from the following:

| Course # | Title | Credits |
|----------|---------------------------------|---------|
| PHYS102 | Fundamentals of Astronomy | 4 |
| CISM125 | Introduction to Computers | 3 |
| CISM135 | Computer Programming-C++ | 4 |
| CISM148 | Problem Solving Using Scripting | 4 |
| CISM159 | Intermediate Programming-C++ | 4 |
| MATH152 | Linear Algebra | 4 |
| MATH220 | Statistical Methods | 4 |
| ENGR125 | Introduction to Electronics | 4 |
| ENGR201 | Statics | 3 |
| ENGR204 | Dynamics | 3 |
| CHEM110 | General Chemistry I | 4 |
| CHEM111 | General Chemistry II | 4 |
| BIOL109 | General Biology I | 4 |
| BIOL110 | General Biology II | 4 |

Technological Competency: 0-4 Credits

(Is fulfilled with CISM125, CISM132, testing or reviewed departmental portfolio. CISM125 may be taken as a Program Elective.)

Total Credits

60

Recommended Sequence of Courses

First Semester

| Course # | Title | Credits |
|-----------------|-------------------------------------|----------------|
| ENGL101 | Composition I | 3 |
| MATH155 | Calculus I | 4 |
| PHYS225 | General Physics I | 4 |
| | Program Elective Course (4 credits) | 4 |

Second Semester

| Course # | Title | Credits |
|-----------------|---|----------------|
| ENGL102 | Composition II | 3 |
| MATH156 | Calculus II | 4 |
| PHYS226 | General Physics II | 4 |
| | Program Elective Course (3 credits) | 3 |
| | General Education Social Science Course (3 credits) | 3 |

Third Semester

| Course # | Title | Credits |
|-----------------|--|----------------|
| MATH255 | Calculus III | 4 |
| PHYS228 | General Physics III | 4 |
| | General Education Social Science or Humanities Course (3 credits) | 3 |
| | Choose: ARTS103, ARTS108, ARTS109, ARTS115, DANC170, MUSC100 or THEA110 (3 credits) | 3 |

Fourth Semester

| Course # | Title | Credits |
|-----------------|---|----------------|
| MATH256 | Differential Equations | 4 |
| PHYS230 | Introduction to Modern Physics | 4 |
| | Program Elective Course (3 credits) | 3 |
| | Choose: PHIL101, PHIL102, PHIL105, PHIL110 or PHIL111 (3 credits) | 3 |

Physics Courses

PHYS100 : Conceptual Physics

This is a one semester, non-mathematical physics course designed for non-science majors. Topics include scientific method, Newton's laws, motion, energy, momentum, rotational motion, gravitation, fluids, heat, electrostatics, DC circuits, sound, light and properties of waves. Laboratory utilizes computers for data acquisition and analysis. Meets General Education requirement for Science.

Credits 4

Lecture Hours 3

Lab/Clinical/Field Study Hours 3

Prerequisites

ENGL080 and MATH073 with grades of C or better or Placement test score or SAT score.

Corequisites

PHYS100L

PHYS102 : Fundamentals of Astronomy

Surveys fundamental concepts of the science of astronomy and the history of studying the universe; places special emphasis on observation, with many labs involving direct viewing of the sky—sometimes with unaided eye from the student's chosen location, sometimes with telescopes at Atlantic Cape or other, darker sites; aims to develop in students a basic understanding of the principles of science in general and astronomy in particular, and have them achieve a proficiency in being able to locate a wide range of specific astronomical objects in the sky. Meets the General Education requirement for Science.

Credits 4

Lecture Hours 3

Lab/Clinical/Field Study Hours 3

Prerequisites

ENGL080 and MATH074 or MATH099 with grades of C or better or Placement test score or SAT score.

PHYS105 : Basic Physics

Includes measurement, motion, vectors, Newton's laws and equilibrium, work and energy, simple machines, rotational motion and rotational equilibrium, fluids, heat, waves, electricity, magnetism, and AC and DC circuits. Laboratory utilizes computers for data acquisition and analysis. Meets General Education requirement for Science.

Credits 4

Lecture Hours 3

Lab/Clinical/Field Study Hours 3

Prerequisites

ENGL080 and MATH074 or MATH099 with grades of C or better or Placement test score or SAT score.

PHYS125 : College Physics I

Algebra/trigonometry-based. Topics include measurement, kinematics in one and two dimensions, Newton's laws, energy, momentum, rotational kinematics and dynamics, and temperature and heat. Laboratory utilizes computers for data acquisition and analysis. Meets General Education requirement for Science.

Credits 4

Lecture Hours 3

Lab/Clinical/Field Study Hours 3

Prerequisites

MATH122 or MATH150 (either may be taken concurrently)

PHYS126 : College Physics II

Algebra/trigonometry-based. Topics include simple harmonic motion, wave phenomena, interference phenomena, electricity, magnetism, simple AC and DC circuits, light and optics. Laboratory utilizes computers for data acquisition and analysis. Meets General Education requirement for Science.

Credits 4

Lecture Hours 3

Lab/Clinical/Field Study Hours 3

Prerequisites

PHYS125 with a C or better

PHYS225 : General Physics I

Calculus-based. Topics include measurement, kinematics in one and two dimensions, Newton's laws, energy, momentum, rotational kinematics and dynamics, equilibrium, and temperature and heat. Laboratory utilizes computers for data acquisition and analysis. Meets General Education requirement for Science.

Credits 4

Lecture Hours 3

Lab/Clinical/Field Study Hours 3

Prerequisites

MATH155 (may be taken concurrently)

PHYS226 : General Physics II

Calculus-based. Topics include simple harmonic motion, wave motion, sound, interference phenomena, electricity and magnetism, AC and DC circuits and electromagnetic waves. Modern Physics is a running theme. Laboratory utilizes computers for data acquisition and analysis. Meets General Education requirement for Science.

Credits 4

Lecture Hours 3

Lab/Clinical/Field Study Hours 3

Prerequisites

PHYS225 with a C or better and MATH156 (MATH156 may be taken concurrently)

PHYS228 : General Physics III

This is a one-semester course which introduces the student to thermodynamics, fluids and optics. The course covers fluid mechanics, conduction of heat, kinetic theory of gasses, the laws of thermodynamics, the nature of light, geometric optics, interference and diffraction. This subject matter will be covered in an introductory manner so as to prepare the student to revisit these topics in more depth in future undergraduate and graduate physics courses. Includes laboratory.

Credits 4

Lecture Hours 3

Lab/Clinical/Field Study Hours 3

Prerequisites

PHYS226 with a C or better and MATH156 (MATH156 may be taken concurrently)

PHYS230 : Introduction to Modern Physics

This is a one-semester course which introduces the student to modern physics. The course covers Maxwell's equations, relativistic mechanics, wave and quantum properties of photons and electrons, the Schrodinger equation, atomic structure, nuclear physics, and elementary particle physics. This subject matter will be covered in an introductory manner so as to prepare the student to revisit these topics in more depth in future undergraduate and graduate physics courses. Includes laboratory.

Credits 4

Lecture Hours 3

Lab/Clinical/Field Study Hours 3

Prerequisites

PHYS228 with a C or better and MATH156