Department of Physics

The mission of the Department of Physics at Georgia Southern University is four-fold. First, to provide its majors with a strong, basic undergraduate physics/astronomy education that will serve them whether they pursue an advanced degree in physics, a professional career in medicine or dentistry, a career in industry or in science education. Second, to provide excellent instruction in introductory physics and astronomy to non-majors. Third, to conduct original research in physics and astronomy that is recognized at regional, national, and international levels. Fourth, to foster an interest in science in the community and the region.

Physics Majors


Physics Minor


ASTR 1000 Introduction to the Universe
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
A study of the motions and constitution of the solar system, stars and other celestial bodies. Theories of evolution of celestial bodies and the universe are considered in addition to the instrumentation used by astronomers.

Prerequisite(s): Prior or concurrent enrollment in ASTR 1211.

ASTR 1020 Stellar and Galactic Astronomy
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
A study of the physical properties of stars and galaxies and of the origins of the universe.

Prerequisite(s): Prior or concurrent enrollment in ASTR 1211.

ASTR 1211 Astronomy Lab
1 Credit Hour. 0 Lecture Hours. 2 Lab Hours.
A series of laboratories designed to measure the physical properties of planets, stars, and galaxies.

Prerequisite(s): Prior or concurrent enrollment in ASTR 1010 or ASTR 1020.

ASTR 3131 Optics
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
Geometric, physical, and quantum optics in which the general principles of wave optics and several optical devices are studied. A minimum grade of "C" in PHYS 2211 and PHYS 2212.

Cross Listing(s): PHYS 3131.

ASTR 3137 The Search for Life in the Universe
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
The course will describe the current quest to find intelligent life in the universe. It will begin with a discussion of the nature and origin of life on Earth. After considering the search for life in our solar system, techniques used to search for extrasolar planets and extraterrestrial life will be explored. The course will also include a discussion of the physical limitations to interstellar spaceflight and alternative methods of communication.

Prerequisite(s): ASTR 1000 or ASTR 1010 or ASTR 1020.

ASTR 3538 Physical Astronomy
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
The physical nature of the solar system, stars and galaxies will be studied in detail. Principles of physics will be used and illustrated, especially in the areas of mechanics, thermodynamics, physical optics, and spectral analysis.

Prerequisite(s): PHYS 2211 or PHYS 1111 and PHYS 2212 or PHYS 1112.

ASTR 3558 Introduction to General Relativity
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
An introduction to the metric description of different spacetimes that describe flat and various curved geometries so as to derive the laws of mechanics for planets, stars, black holes, etc. The course also introduces a very simple model of the expanding universe and briefly introduces cosmology.

Prerequisite(s): PHYS 3537 or permission of instructor.

Cross Listing(s): PHYS 3558.

ASTR 3790 Teaching Internship in Astronomy
1-2 Credit Hours. 0 Lecture Hours. 0 Lab Hours.
The internship allows students to investigate teaching practices in astronomy. The student will participate in an introductory workshop immediately prior to the start of the semester, intern in the planetarium, and meet with the faculty mentor one hour each week.

Prerequisite(s): Permission of instructor required and ASTR 1000 or ASTR 1010 or ASTR 1020.

ASTR 4130 Astrophysics
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
This course will cover advanced topics in Astrophysics. Students will become familiar with the fundamental physics of stars. This includes stellar atmospheres, interiors, and evolution. Students will study the atomic properties of matter and its interaction with light. Students will also study techniques for observing stars using telescopes and interferometers.

Prerequisite(s): PHYS 1112 or PHYS 2212.

ASTR 4138 Galactic Astronomy
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
Galactic Astronomy will cover advanced topics in galactic structure and evolution. This includes galaxy morphology, stellar and gaseous content, stellar orbits, disk dynamics, central massive black holes, large scale structure, interactions and evolution in a cosmological setting. Students will also be introduced to the historic development of our modern view of the universe.

Prerequisite(s): PHYS 1112 or PHYS 2212.

ASTR 4330 Observational Techniques in Astronomy
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
This course will cover advanced topics in astronomical observing techniques. This includes the basic physical principles and methods needed to plan, obtain, and reduce photometric data of celestial objects. Students will be introduced to the principles of spherical astronomy, photoelectric detectors, atmospheric extinction and standard system transformations, and the Image Reduction and Analysis (IRAF) software package.

Prerequisite(s): PHYS 1112 or PHYS 2212.

ASTR 5090 Selected Topics in Astronomy
2-5 Credit Hours. 0-5 Lecture Hours. 0-6 Lab Hours.
A course allowing for investigation of selected topics in Astronomy; it will be taught on a one-time basis. Lecture only courses can be for two, three, or five credit hours. For laboratory courses, one credit hour will be given for every three hours spent working in lab.

Prerequisite(s): PHYS 1112 or PHYS 2212.

Cross Listing(s): ASTR 5090G.

ASTR 5555 Special Topics in Astrophysics
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
ASTR 5890  Astronomy Research Experience
1-4 Credit Hours. 0-3 Lecture Hours. 0 Lab Hours.
An independent astronomy research experience in which a student will investigate a research question under the direction of a faculty member. Students will be expected to maintain a laboratory notebook, prepare a written summary of the research, and give an oral presentation at the end of the experience. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
Prerequisite(s): Permission of instructor required.
Cross Listing(s): ASTR 5890G.

PHYS 1111  Introduction to Physics I
0,4 Credit Hours. 0,3 Lecture Hours. 0,3 Lab Hours.
This is the first of a sequence of courses which provide a working knowledge of the basic principles of physics. Topics include mechanics, oscillations and wave motion. The student should have had pre-calculus, or have an equivalent knowledge of algebra and trigonometry.
Prerequisite(s): MATH 1113 or MATH 1112.
Cross Listing(s): PHYS 1111S.

PHYS 1111S  Intro Phys I/CoReq PHYS 1113
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
This is the first of a sequence of courses which provide a working knowledge of the basic principles of physics. Topics include mechanics, oscillations and wave motion. The student should have had pre-calculus, or have an equivalent knowledge of algebra and trigonometry.
Prerequisite(s): MATH 1113 or MATH 1112.
Cross Listing(s): PHYS 1111.

PHYS 1112  Introduction to Physics II
4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.
This is the second in a sequence of two courses which provide a working knowledge of the basic principles of physics using application that require a knowledge of trigonometry and elementary algebra. Topics include electricity and magnetism, optics and modern physics.
Prerequisite(s): PHYS 1111.

PHYS 1135  How Things Work
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
This is a non-mathematical course designed for liberal arts students. Fifty-one objects in our everyday world are examined to answer the question “How do they work?”. As a result concepts of physics that everyone uses daily are revealed in an interesting and understandable manner.

PHYS 1149  Environmental Physics
0,4 Credit Hours. 0,4 Lecture Hours. 0 Lab Hours.
A general course on the physical basis of environmental science. Emphasis is placed on the identification and effective amelioration of both natural and man-made hazards to the earth’s biosphere. Topics include greenhouse effects, ozone, acid rain, energy production and water disposal, radiation hazards, noise pollution and disruptive natural phenomena.

PHYS 1211K  Principles of Physics I
4 Credit Hours. 4 Lecture Hours. 0 Lab Hours.
An introductory course which will include material from mechanics, thermodynamics and waves. Elementary differential calculus will be used. This course has a laboratory component that requires a lab kit.

PHYS 2211  Principles of Physics I
4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.
This is the first of a sequence of two courses that provide a working knowledge of the basic principles of physics using applications requiring a knowledge of calculus. Topics include mechanics, wave motion and thermodynamics.
Prerequisite(s): Prior or concurrent enrollment in MATH 1441.
Cross Listing(s): PHYS 2211H.

PHYS 2211H  Principles of Physics I (HONORS)
4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.
This is the first of a sequence of two courses that provide a working knowledge of the basic principles of physics using applications requiring a knowledge of calculus. Topics include mechanics, wave motion and thermodynamics.
Prerequisite(s): Prior or concurrent enrollment in MATH 1441.
Cross Listing(s): PHYS 2211.

PHYS 2212  Principles of Physics II
4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.
This is the second of a sequence of courses which provide a working knowledge of the basic principles of physics using applications requiring a knowledge of calculus. Topics include electricity, magnetism, optics and modern physics.
Prerequisite(s): A minimum grade of "C" in PHYS 2211.
Cross Listing(s): PHYS 2212H, PHYS 2212S.

PHYS 2212H  Principles of Physics II (HONORS)
4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.
This is the second of a sequence of courses which provide a working knowledge of the basic principles of physics using applications requiring a knowledge of calculus. Topics include electricity, magnetism, optics and modern physics.
Prerequisite(s): A minimum grade of "C" in PHYS 2211.
Cross Listing(s): PHYS 2212.

PHYS 3130  Sound Waves and Acoustics
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
A study of the production, transformation, reflection, absorption, and general effects of vibration and sound.
Prerequisite(s): A minimum grade of "C" in PHYS 2211 and PHYS 2212.

PHYS 3131  Optics
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
Geometric, physical, and quantum optics in which the general principles of wave optics and several optical devices are studied.
Prerequisite(s): A minimum grade of "C" in PHYS 2211 and PHYS 2212.

PHYS 3149  Methods of Theoretical Physics
0,4 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
Presents a discussion of methods for solving the equations that arise in all of the major areas of physics.
Prerequisite(s): MATH 3230 and a minimum grade of "C" in PHYS 2211 and PHYS 2212.

PHYS 3520  Problem Solving in Physics
2 Credit Hours. 2 Lecture Hours. 0 Lab Hours.
Improves the ability of Physics majors to rapidly consolidate and inter-relate knowledge of their physics courses by familiarization with the techniques of rapid characterization and solution of problems and by in-class practice of rapid problem-solving.
Prerequisite(s): PHYS 3537.
Cross Listing(s): PHYS 3520S.

PHYS 3536  Modern Physics I
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
Historical development of modern physics including topics on special theory of relativity, early models of the atom, atomic radiations and interaction of electrons with matter.
Prerequisite(s): A minimum grade of "C" in PHYS 2211 and PHYS 2212.
Cross Listing(s): PHYS 3536H.
PHYS 3536 Modern Physics I
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
Historical development of modern physics including topics on special
theory of relativity, early models of the atom, atomic radiations and
interaction of electrons with matter.
Prerequisite(s): A minimum grade of "C" in PHYS 2211 and PHYS 2212.
Cross Listing(s): PHYS 3536.

PHYS 3537 Modern Physics II
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
A continuation of modern physics topics including atomic and molecular
physics and nuclear physics.
Prerequisite(s): PHYS 3536.
Cross Listing(s): PHYS 3537H.

PHYS 3537H Modern Physics II (Honors)
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
A continuation of modern physics topics including atomic and molecular
physics and nuclear physics.
Prerequisite(s): PHYS 3536.
Cross Listing(s): PHYS 3537.

PHYS 3539 Introduction to Biophysics
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
The physics of living organisms with emphasis on physical support,
movement, sensory perception and the physical properties of plant and
animal processors at the molecular and organismic levels of organization.
Permission of instructor required.

PHYS 3542 Analog Electronics
4 Credit Hours. 2 Lecture Hours. 6 Lab Hours.
A course in intermediate electronics with emphasis on topics of interest to
students in physics. Discusses electronic instruments, transducers, diodes
and power supplies. Amplifier behavior, the operational amplifier and wave
shaping circuits are covered in detail. Discrete electronic devices are also
discussed.
Prerequisite(s): A minimum grade of "C" in PHYS 2211 and PHYS 2212.

PHYS 3543 Digital Electronics
4 Credit Hours. 2 Lecture Hours. 6 Lab Hours.
Presents the concepts and application of digital electronics. Digital logic
concepts and techniques are presented. Flip-flops and counting circuits are studied extensively resulting in a discussion of digital instrument
development. The principles of operation, general architecture and some
applications of the microprocessor (the Intel 8085) are discussed.
Prerequisite(s): PHYS 3542.

PHYS 3558 Introduction to General Relativity
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
An introduction to the metric description of different spacetimes that
describe flat and various curved geometries so as to derive the laws of
mechanics for planets, stars, black holes, etc. The course also introduces
a very simple model of the expanding universe and briefly introduces cosmology.
Prerequisite(s): PHYS 3537.
Cross Listing(s): ASTR 3558, PHYS 3558H.

PHYS 3558H Intro to General Relativity
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
An introduction to the metric description of different spacetimes that
describe flat and various curved geometries so as to derive the laws of
mechanics for planets, stars, blackholes, etc. The course also introduces
a very simple model of the expanding universe and briefly introduces cosmology.
Prerequisite(s): PHYS 3537.
Cross Listing(s): PHYS 3558, ASTR 3558.

PHYS 3570 Teaching Internship in Physics
1-2 Credit Hours. 0 Lecture Hours. 0 Lab Hours.
The internship allows students to investigate teaching practices in physics.
The student will participate in an introductory workshop immediately
prior to the start of the semester, intern in a PHYS 1113 and/or PHYS
1114 laboratory, and meet with the faculty mentor one hour each week throughout the semester. 1 credit hour per laboratory section in which the
student interns.
Prerequisite(s): A minimum grade of "C" in PHYS 2212.
Cross Listing(s): ASTR 3790.

PHYS 4131 Quantum Optics
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
Involves theories related to laser spectroscopy, nonlinear optics, laser
pulse propagation, laser cooling and various effects in laser spectroscopy related to quantum interference.
Prerequisite(s): A minimum grade of "C" in PHYS 3536.

PHYS 4232 Properties of Materials
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
Introduction to the properties of semiconductors, magnetic materials and
superconductors. Particular emphasis will be placed on semiconductors with regard to developing an understanding of light emitting diodes, diode
lasers and quantum well devices.
Prerequisite(s): A minimum grade of "C" in PHYS 2211 and PHYS 2212.

PHYS 4332 Principles of Lasers
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
An introduction to the basic principles of laser oscillation, construction and
operation of the most common laser systems, based on the rate equation and laser cavity theory. This course also provides practical experience in
the use of many laser systems and in laser radiation safety.
Prerequisite(s): A minimum grade of "C" in PHYS 2211 and PHYS 2212.

PHYS 4421 Advanced Physics Lab I
2 Credit Hours. 0 Lecture Hours. 6 Lab Hours.
A laboratory course where the student will learn classical laboratory
techniques, computer data acquisition, statistical analysis of data and
proper reporting of results.
Prerequisite(s): A minimum grade of "C" in PHYS 2212.

PHYS 4422 Advanced Physics Lab II
2 Credit Hours. 0 Lecture Hours. 6 Lab Hours.
This is a laboratory course where students will learn how to critically read
scientific literature, develop a research proposal, conduct experimental physics research, and present a research project.
Prerequisite(s): PHYS 4421.
Cross Listing(s): PHYS 4422H.

PHYS 4422H Advanced Physics Lab II
2 Credit Hours. 0 Lecture Hours. 6 Lab Hours.
This is a laboratory course where students will learn how to critically read
scientific literature, develop a research proposal, conduct experimental physics research, and present a research project.
Prerequisite(s): PHYS 4421.
Cross Listing(s): PHYS 4422.

PHYS 4790 Internship in Physics
1-6 Credit Hours. 0 Lecture Hours. 0 Lab Hours.
The internship allows physics majors to work in a professional setting
related to their chosen concentration. Students can earn between one
and six credits for internships approved by their academic advisor and
the Physics Internship Director. Students must complete a minimum of 5
hours of on-site work per week for each credit hour earned. Students must
maintain contact with the Physics Internship Director through the course of
the internship work, and must give an oral presentation at the end of the
semester. Internship credits can be used for elective credit only and may
not substitute for specific degree requirements. Requires permission of
Physics Internship Director.
PHYS 5090 Selected Topics in Physics
2-5 Credit Hours. 0-5 Lecture Hours. 0-6 Lab Hours.
A course allowing for investigation of selected topics in Physics; it will be taught on a one-time basis. Lecture only course can be for two, three, or five credit hours. For laboratory courses, one credit hour will be given for every three hours spent working in lab. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
Prerequisite(s): A minimum grade of "C" in PHYS 1112 or PHYS 2212.
Cross Listing(s): ASTR 5090, ASTR 5090G, PHYS 5090G.

PHYS 5151 Classical Mechanics
5 Credit Hours. 5 Lecture Hours. 0 Lab Hours.
Provides physics majors and student of applied mathematics and engineering with the fundamentals of analytical mechanics. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
Prerequisite(s): PHYS 2211 and PHYS 2212 with a minimum grade of "C", and MATH 3230.
Cross Listing(s): PHYS 5151G.

PHYS 5152 Classical E and M Theory
5 Credit Hours. 5 Lecture Hours. 0 Lab Hours.
Provides physics majors and students of applied mathematics and engineering with the fundamentals of electromagnetic field theory. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
Prerequisite(s): PHYS 5151.
Cross Listing(s): PHYS 5152G.

PHYS 5530 Thermal Physics
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
A course in classical thermodynamics and kinetic theory. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
Prerequisite(s): PHYS 2211 and PHYS 2212, with a minimum grade of "C", and MATH 2243 or MATH 2243H.
Cross Listing(s): PHYS 5530G, PHYS 5530H.

PHYS 5530H Thermal Physics (Honors)
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
A course in classical thermodynamics and kinetic theory. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
Prerequisite(s): PHYS 2211 and PHYS 2212, with a minimum grade of "C", and MATH 2243 or MATH 2243H.
Cross Listing(s): PHYS 5530G, PHYS 5530.

PHYS 5536 Studies in Physics for Secondary Teachers
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
Designed to acquaint the student with some of the problems encountered in high school physics presentations. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
Prerequisite(s): MATH 1113.
Cross Listing(s): PHYS 5536G.

PHYS 5557 Quantum Mechanics
5 Credit Hours. 5 Lecture Hours. 0 Lab Hours.
A study of the basic postulates of quantum mechanics with solutions to Schrodinger's wave equation for simple applications: the techniques of calculating position, energy and momentum with operators and the elements of perturbation theory with application to atomic spectra. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
Prerequisite(s): PHYS 3536, PHYS 3537, and MATH 3230.
Cross Listing(s): PHYS 5557H and PHYS 5557G.

PHYS 5557H Quantum Mechanics
5 Credit Hours. 5 Lecture Hours. 0 Lab Hours.
A study of the basic postulates of quantum mechanics with solutions to Schrodinger's wave equation for simple applications: the techniques of calculating position, energy and momentum with operators and the elements of perturbation theory with application to atomic spectra. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
Prerequisite(s): PHYS 3536, PHYS 3537, and MATH 3230.
Cross Listing(s): PHYS 5557 and PHYS 5557G.

PHYS 5890 Physics Research Experience
1-4 Credit Hours. 0-3 Lecture Hours. 0 Lab Hours.
An independent physics research experience in which a student will investigate a research question under the direction of a faculty member. Students will be expected to maintain a laboratory notebook, prepare a written summary of the research, and give an oral presentation at the end of the experience. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do. Permission of instructor is required.
Cross Listing(s): PHYS 5890H, PHYS 5890G, ASTR 5890, ASTR 5890G.

PHYS 5890H Physics Research Experience
1-4 Credit Hours. 0-3 Lecture Hours. 0 Lab Hours.
An independent physics research experience in which a student will investigate a research question under the direction of a faculty member. Students will be expected to maintain a laboratory notebook, prepare a written summary of the research, and give an oral presentation at the end of the experience.
Cross Listing(s): PHYS 5890H, PHYS 5890G, ASTR 5890, ASTR 5890G.