

SCIENCE

Graduation requirement: three credits of high school science

Core classes: offered at honors, college prep, and foundations levels

Earth Systems (9th grade) → Biology (10th grade)

In the junior and senior year, GSA offers alternating years of science courses. A small number of junior and senior courses are offered each year.

2019-2020

Chemistry Honors Chemistry	year	For students planning to pursue any medical or scientific career, including nursing and engineering
Chemistry Foundations	year	For students planning to go to technical school
AP Biology	year	For students interested in advanced study of life sciences
AP Environmental Science	year	For students interested in local and global environmental issues
The Maine Environment A The Maine Environment B	semester	For students interested in learning about their local environment
Astronomy A Astronomy B	semester semester	For juniors and seniors who've already passed biology
Anatomy and Physiology A Anatomy and Physiology B	semester	For students going into the medical field
Marine Ecology Research Honors	year	For students interested in marine ecology and authentic scientific research opportunities

2020-2021

Physics Honors Physics	year	Physics options for students planning to pursue any medical, engineering, or scientific career, including nursing
Integrated Physical Science Foundations Physics Through Technology	year year	Two physics options for students planning to go to technical school
AP Biology	year	For students interested in advanced study of life sciences
AP Environmental Science Environmental Science	year	For students interested in local and global environmental issues
Marine Ecology Research Honors	year	For students interested in marine ecology and authentic scientific research opportunities
Anatomy and Physiology A Anatomy and Physiology B	semester	For students going into the medical field
Marine Science A Marine Science B	semester	For students interested in the sea around us and the life within
Forensics A Forensics B	semester semester	For students interested in solving crimes using science

Course #	Course Title	Grade Level	Credits	Prerequisites
400	Exploring Earth Systems	9	1	
401	Earth Systems Foundations	9	1	
405	Exploring Earth Systems Honors	9	1	Co-requisite Alg. I Honors
420	Biology	10	1	Earth Systems
425	Biology Honors	10	1	Earth Systems
452	Biology Foundations	10	1	Earth Systems
442	Chemistry	11-12	1	Biology and Algebra
443	Chemistry Foundations	11-12	1	Biology and Algebra
445	Chemistry Honors	11-12	1	Biology and Algebra I
473	<i>Integrated Physical Science Foundations</i>	<i>11-12</i>	<i>1</i>	<i>Biology</i>
474	<i>Physics</i>	<i>11-12</i>	<i>1</i>	<i>Algebra II</i>
475	<i>Physics Honors</i>	<i>11-12</i>	<i>1</i>	<i>Biology and Algebra II</i>
433	<i>Physics Through Technology</i>	<i>11-12</i>	<i>1</i>	<i>Algebra</i>
436	<i>Forensics A</i>	<i>11-12</i>	<i>½</i>	<i>Biology</i>
438	<i>Forensics B</i>	<i>11-12</i>	<i>½</i>	<i>Biology</i>
437	<i>Marine Science A</i>	<i>11-12</i>	<i>½</i>	<i>Biology</i>
439	<i>Marine Science B</i>	<i>11-12</i>	<i>½</i>	<i>Biology</i>
480	Anatomy & Physiology A	11-12	½	Biology
481	Anatomy & Physiology B	11-12	½	Biology
458	The Maine Environment A	11-12	½	Biology
459	The Maine Environment B	11-12	½	Biology
470	Astronomy A	11-12	½	Biology
471	Astronomy B	11-12	½	Biology
454	<i>Science Through Technology</i>	<i>11-12</i>	<i>1</i>	<i>Biology</i>
461	<i>Environmental Science</i>	<i>11-12</i>	<i>1</i>	<i>Biology</i>
465	AP Environmental Science	11-12	1	Biology and Algebra
428	AP Biology	11-12	1	Biology; Chemistry
485	Marine Ecology Research Honors	11-12	1	Biology

400 EXPLORING EARTH SYSTEMS, 9 (1 credit)

This ninth-grade science course explores interactions between the geosphere, atmosphere, hydrosphere, and biosphere. This course will integrate chemistry, physics, biology, and earth science while investigating issues of relevance to everyone. Lab work, fieldwork, and analysis of data will be important components of this course.

401 EARTH SYSTEMS FOUNDATIONS, 9 (1 credit)

This ninth-grade course is designed to strengthen basic skills and stimulate interest in the sciences through an exploration of interactions between the geosphere, atmosphere, hydrosphere, and biosphere. Lab work, fieldwork, and analysis of data will be important components of this course.

405 EXPLORING EARTH SYSTEMS HONORS, 9 (1 credit)

Prerequisites: Must be enrolled in or have completed Algebra I Honors or Algebra II Honors

This challenging ninth-grade science course is an exploration of interactions between the geosphere, atmosphere, hydrosphere, and biosphere. This course will integrate chemistry, physics, biology, and earth science while investigating issues of relevance to everyone. Lab work, fieldwork, and analysis of data will be important components of this course. Students may be required to conduct independent research. Exploring Earth Systems Honors goes into greater detail in each topic and is more math-intensive than Exploring Earth Systems.

420 BIOLOGY, 10 (1 credit)

Prerequisites: Exploring Earth Systems or Exploring Earth Systems Honors, or Earth Systems Foundations with teacher recommendation

This course is designed to provide students with a survey of the science of biology, covering ecology, evolution, and cell biology, including photosynthesis, cellular respiration, and genetics. Lab work reinforces classroom study. Emphasized skills include reading for understanding of content, data organization and analysis, use of lab equipment, use of the internet for scientific research, and scientific reasoning.

425 BIOLOGY HONORS, 10 (1 credit)

Prerequisites: Exploring Earth Systems or Exploring Earth Systems Honors

This course is designed to provide students with a survey of the science of biology. Areas of study include: ecology, the cell, photosynthesis, cellular respiration and division, reproduction, heredity, evolution, and classification of organisms from each of the phyla. Biology Honors students will be expected to complete a research presentation and additional readings, as well as to read at an independent level and to be personally responsible for their work planning and budgeting of time. Biology Honors goes into greater detail on each of the topics than Biology. Lab work is coordinated with and reinforces classroom study.

452 BIOLOGY FOUNDATIONS, 10 (1 credit)

Prerequisites: Earth Systems Foundations or teacher recommendation

This course explores the basic principles of biology, such as taxonomy and the diversity of life, cells, genetics, anatomy and physiology, cycles of matter, ecology, and evolution. Students will be encouraged to examine real-world issues as they relate to biological concepts. Lab investigations are an important part of this course.

442 CHEMISTRY, 11-12 (1 credit)

Prerequisites: Biology or Biology Honors, and Algebra I or Algebra I Honors

This is a laboratory and math-intensive course for any student with an interest in chemistry. Students should be comfortable with Algebra and problem-solving. Students will learn the principles of chemistry through a mixture of laboratory, discussion, team-learning, and lecture formats. Topics covered include atomic structure, the states of matter, chemical names and formulas, chemical reactions, stoichiometry, the nature of energy, gas laws, electron structure and bonding, solution chemistry, and acids and bases. Laboratory investigations reinforce material covered in the class. Student evaluation will be based primarily upon reports, group work, quizzes, and tests.

443 CHEMISTRY FOUNDATIONS, 11-12 (1 credit)

Prerequisites: Biology or Biology Foundations, and Algebra I or Algebra Foundations is strongly recommended

This is a laboratory course for any student with an interest in chemistry, but by itself, it is not intended to prepare students for college level chemistry. Through laboratory investigations, readings, and discussions, students will explore chemistry as it relates to everyday life. Topics will include atoms, elements, compounds, and chemical reactions, as well as pressure and temperature.

445 CHEMISTRY HONORS, 11-12 (1 credit)

Prerequisites: Biology or Biology Honors, and Algebra I or Algebra I Honors

This is a laboratory problem-solving course for honors students with a serious interest in chemistry. Students enrolled in this course should be very comfortable with algebra. This course is faster paced and covers more content than Chemistry. Students in this course will learn the principles of chemistry through a mixture of laboratory, discussion, and lecture formats. Topics covered include atomic structure, chemical names and formulas, chemical reactions, stoichiometry, the states of matter, gas laws, electron structure and bonding, solution chemistry, reaction rates and equilibrium, acids and bases, oxidation-reduction reactions, electrochemistry, and organic chemistry. Laboratory investigations and reports will review and reinforce material covered in the class. Student evaluation will be based primarily upon reports, group projects, quizzes, and tests.

473 INTEGRATED PHYSICAL SCIENCE FOUNDATIONS, 11-12 (1 credit) - Not offered 2019-20

Prerequisites: Biology

This laboratory course provides students with broad-based, hands-on learning experience in the various disciplines of physical science. The course centers around quarter-long sections on geology, meteorology, physics, and astronomy. Although there will be some mathematics, the emphasis of the course will be on the application of knowledge to solve problems and investigate scientific principles.

474 PHYSICS, 11-12 (1 credit) - Not offered 2019-20

Prerequisites: Biology or Biology Honors, and students must have passed or be enrolled in Algebra II or Algebra II Honors

This is a math-intensive, problem-solving course for any student with a serious interest in mathematical problem-solving and the physical sciences. Students will learn from a combination of lectures, reading, labs, and problem-solving. Topics to be discussed will include concepts of mechanics including motion, forces, momentum, energy and energy transfer as well as heat, light, electricity and magnetism, relativity, and quantum theory.

475 PHYSICS HONORS, 11-12 (1 credit) - Not offered 2019-20

Prerequisites: Biology or Biology Honors, and students must have successfully completed or be enrolled in Algebra II or Algebra II Honors

This is a math-intensive, problem-solving course for any student with a serious interest in mathematical problem-solving and the physical sciences. This course covers more content and goes at a faster pace than Physics. For example, vector operations in Physics will be limited to simpler cases, while in Physics Honors, trigonometry will be required. Students will learn from a combination of lectures, reading, labs, and problem-solving. Topics to be discussed will include concepts of mechanics including motion, forces, momentum, energy and energy transfer, as well as heat, light, electricity and magnetism, relativity, and quantum theory.

433 PHYSICS THROUGH TECHNOLOGY, 11-12 (1 credit) – Not offered 2019-20

Prerequisites: Algebra I, Algebra I Foundations, or Algebra I Honors

This course is activity oriented. Units are designed to help students understand that physics is used to help solve everyday problems by constructing devices to better serve our needs. Topics of study will be measuring devices; heat and temperature; properties of solids, liquids and gases; laws of motion, momentum, and mechanical energy like in rotational and circular systems; electricity and magnetism principles used in circuits, motors, and generators; and hydraulic systems.

436 FORENSICS A 11-12 (½ credit) – Not offered 2019-20

438 FORENSICS B, 11-12 (½ credit) – Not offered 2019-20

Prerequisites: Biology, Biology Honors, or Biology Foundations. Forensics A is not a prerequisite for Forensics B, but is strongly recommended.

Forensics may be taken in the fall and/or spring semester(s). It will incorporate skills acquired in biology, chemistry, and physics while learning techniques used by FBI and local police crime scene technicians. Topics covered may include the history of forensics, crime scene analysis, physical evidence, famous cases, hair and fiber analysis, fingerprinting, DNA, foot and tire prints, fingerprinting, chemical detection, blood analysis and patterns, ballistics, handwriting analysis, facial reconstruction, anatomy, and fire and accident reconstruction. Along with hands-on labs skills, students will be solving mock crimes, requiring students to think, analyze, and imagine possible scenarios. Students will be required to work individually on research projects and in teams when analyzing mock crime scenes.

437 MARINE SCIENCE A, 11-12 (½ credit) – Not offered 2019-20

439 MARINE SCIENCE B, 11-12 (½ credit) – Not offered 2019-20

Prerequisites: Biology, Biology Honors, or Biology Foundations. Marine Science A is not a prerequisite for Marine Science B.

Students will build on information learned in biology and chemistry and will be required to complete independent presentations as well as read at an independent level. The course will incorporate marine biology, marine geology, and oceanography, and may include many of the following topics during the course of the year: the study of organisms, their environment from the high-water mark to the deep oceans, their interactions and classifications, examination of how coastlines are created and how they change over the course of the years and seasons; exploration of ocean currents; tides; salinity and ocean chemistry; sediments, continental margins, ocean basins, and ocean bottom exploration; waves, wave formation, and tsunamis; marine resources; environmental concerns; and atmospheric and ocean circulation and weather phenomena created by the oceans. The first and second semester cover different information.

480 ANATOMY AND PHYSIOLOGY A, 11-12 (1/2 credit)

481 ANATOMY AND PHYSIOLOGY B, 11-12 (1/2 credit)

Prerequisites: Biology

This course, which may be taken for one or two semesters, is designed for those wishing to enter any health-related profession or anyone generally curious about the human body. Students study most of the human body systems including muscular, nervous, skeletal, endocrine, cardiovascular, respiratory, digestive, and urinary. The course emphasizes lab work. *Note: We will dissect vertebrate specimens.*

458 THE MAINE ENVIRONMENT A, 11-12 (½ credit)

459 THE MAINE ENVIRONMENT B, 11-12 (½ credit)

Prerequisites: Biology, Biology Honors, or Biology Foundations. The Maine Environment A is not a prerequisite for The Maine Environment B, but is strongly recommended.

In this course, students will study natural history and gain an appreciation for the Maine environment. We will explore all aspects of the natural world from the land to the sea and from the trees to the soil. The curriculum will follow the four seasons we experience in Maine, and each season, we will explore which natural resources are harvested or managed (from deer hunting to forestry conservation). We will consider the impact of climate change and how human modification of the environment is influencing the population dynamics of different species, such as deer, moose, ticks, scallops, white pine trees, salmon, bears, turkeys, and woodpeckers. We will explore how scientific studies inform current fishing and hunting laws. We will bring in experts such as forestry ecologists, game wardens, freshwater fish biologists, state lawmakers, and local land trust managers. Overall, we will learn how science-based research can be used to protect and preserve the rich natural resources of our Pine Tree State for future generations of Mainers to enjoy.

470 ASTRONOMY A, 11-12 (1/2 credit)

471 ASTRONOMY B, 11-12 (1/2 credit)

Prerequisites: Biology, Biology Honors, or Biology Foundations

This course exposes students to the practices and methods of one of the physical sciences, astronomy. Students learn concepts of modern astronomy, conduct observations through sky simulations, do laboratory

and field investigations, work collaboratively, use scientific methods, and make informed decisions using critical thinking and scientific problem-solving. The course covers the following topics: discovering the night sky; gravitation and the motions of the planets; light, color, and telescopes; our star, the sun; the solar system, including both the terrestrial planets and the Jovian planets; moons; comets and asteroids; the lives of stars, galaxies, and cosmology; and exoplanets, astrobiology, and space exploration.

454 SCIENCE THROUGH TECHNOLOGY, 11-12 (1 credit) – Not offered 2019-20

Prerequisites: Biology, Biology Honors, or Biology Foundations

This course is divided into four units of work over the two semesters. The program is an activity-based course that will give the student technological experiences in the areas of solar energy, fluid energy, electrical energy, and mechanical energy. Students will study scientific principles in these areas and then put these ideas into application through technological activities and working models constructed by the students.

461 ENVIRONMENTAL SCIENCE, 11-12 (1 credit) - Not offered 2019-20

Prerequisites: Biology, Biology Honors, or Biology Foundations

This course is an introduction to environmental issues with an emphasis on Maine. Topics include population dynamics, pollution, land use, energy, climate change, renewable and nonrenewable resources, risk assessment, and solutions to environmental solutions. Labs and field activities are important elements of this course.

465 AP ENVIRONMENTAL SCIENCE, 11-12 (1 credit)

Prerequisites: Biology or Biology Honors and Algebra I or Algebra I Honors

This is a rigorous interdisciplinary course that explores the interconnections between the physical environment and living organisms, the impact of human activities on our planet, and our choices for the future. Topics to be covered include population dynamics, pollution, climate change, renewable and nonrenewable resources, risk assessment, and solutions to environmental problems. Labs and field activities are designed to encourage students to critically observe environmental systems, develop and conduct well-designed experiments, and analyze and interpret data.

428 AP BIOLOGY, 11-12 (1 credit)

Prerequisites: Biology, Biology Honors, or teacher recommendation. Students must have taken Chemistry or Chemistry Honors, or be taking them concurrently with AP Biology

This college-level biology course covers the same areas of study as the basic biology courses. Students in this course will be prepared for the AP Biology exam and are expected to take it.

485 MARINE ECOLOGY RESEARCH HONORS, 11-12 (1 credit)

Prerequisites: Biology

This course is about marine ecology, which is the study of the interaction between organisms and their environment. It is intended for science-oriented students who have an interest in the ocean environment and want to learn how to conduct marine research. Students learn different research methods and techniques, and there will be an opportunity to conduct independent research projects to gain a better understanding of the full scientific process. The class takes advantage of our coastal campus and bases our work at field sites close to school. Investigation of the biological and physical factors that influence different habitats is the target of study, from the critters that control the rocky shore, to the open ocean dynamics that influence planktonic communities. Students will also conduct interviews with marine scientists from around the U.S. and visit at least one marine research facility in Maine.