

Science 24-25

4111: Earth & Space Sciences (formerly PS:Earth Science)

This Next Generation Science course invites students to explore the universe and its stars, travel back through the history of the Earth, examine interactions between materials and Earth's systems, identify climate patterns, determine factors that impact weather and climate and develop solutions for global concerns. Students will apply modeling, engineering design, and problem-solving techniques to reinforce their understanding of Earth and space systems. Successful completion of NYS Required Investigations and laboratory activities are required for admission to the Earth & Space Science Regents exam. All students take the Earth & Space Science Regents exam at the conclusion of course.

Prerequisite(s): None

Grade(s): 9, 10, 11, 12

Credit: 1

Meets: 7.5 periods weekly

4211: Life Science: Biology (formerly Living Environment)

This is a comprehensive Next Generation Science Standards aligned course that applies inquiry and hands-on learning to delve into topics including structure and specialized functions of cells, metabolic processes and interacting body systems, living organisms and their role within ecosystems, inheritance of traits, and evolution. This course develops understanding of cause and effect relationships, identification of patterns, and evaluation of evidence to support or refute claims. Students will ask questions, create models and apply engineering design to solve problems and gain a deeper understanding of biological concepts. Successful completion of NYS Required Investigations and laboratory activities are required for admission to the Biology Regents Examination. All students take the Life Science: Biology Regents exam at the conclusion of the course.

Prerequisite(s): Earth Science or Earth & Space Science

Grade(s): 9, 10, 11, 12

Credit: 1

Meets: 7.5 periods weekly

4311: Physical Setting/Chemistry

In this course students learn how to observe and describe experiences, to organize facts, to generalize relationships, and to predict future experiences. They gain a modern view of the fundamental concepts of chemistry. This includes a thorough understanding of the following topics: matter and energy, atomic structure, bonding, the periodic table, the mathematics of chemistry, kinetics and equilibrium, acids and bases, redox and electrochemistry, organic chemistry, applications of chemical principles, and nuclear chemistry. Laboratory work is a major part of the course. Successful completion of laboratory assignments is required for admission to the Regents

Examination. All students take the Physical Setting: Chemistry Regents Examination at the end of the course.

Prerequisite(s): Integrated Algebra and Living Environment/ Life Science: Biology

Grades: 10, 11, 12

Credit: 1

Meets: 7.5 periods weekly

4321: Discrete Chemistry

Discrete Chemistry is an activity, project and laboratory based physical setting course for students interested in completing their science requirements but may not become science majors in college. Students will develop and use knowledge of matter and its chemical properties to make informed decisions about the application of Science and Technology to enhance the quality of their lives. Students take advantage of a valuable chemistry curriculum that will benefit them in their everyday lives as well as in their college years.

Prerequisite(s): Living Environment or Life Science: Biology

Grade(s): 11, 12

Credit: 1

Meets: 5 periods weekly

4411: Regents Physical Setting/Physics

Class discussions involving descriptions and explanations of various physical phenomena, related lab experiments, and interactive online apps enable students to have an understanding of 11 course topics involving objects' motion, the forces that change objects' motion, the work done on objects that change their energy; we also study electricity, magnetism, waves, and nuclear processes. Through lab work, the students properly apply the scientific method, and refine their understanding of physics. Through discussions and problem solving, students develop patterns and efficient practice of logical thinking. Successful completion of laboratory assignments is required for admission to the Regents Examination. All students take the Physical Setting/Physics Regents examination at the end of the course.

Prerequisites: Algebra I and Geometry

Grade(s): 11, 12

Credit: 1

Meets: 7.5 periods weekly

4417: Advanced Placement Physics I

Advanced Placement Physics I is the equivalent to a first-semester college course in algebra-based physics. The course covers Newtonian mechanics (including rotational dynamics and angular momentum); work, energy, and power. This course will also cover Fluid Dynamics. College credits may be earned based upon the score achieved on the AP Exam. AP Physics covers more topics than Regents Physics and moves at a faster pace. Subject matter is treated in a highly mathematical and conceptual manner and is discussed in greater depth than in the Regents course. Successful completion of the laboratory assignments is a requirement for

admission to the Regents. All students enrolled in AP Physics will be required to take the AP Exam in May in addition to the Regents Exam in June.

Prerequisite(s): Regents Chemistry and Algebra 2 (Precalculus may be taken concurrently)

Grade(s): 11, 12

Credit: 1

Meets: 10 periods weekly

4427: Advanced Placement Physics II

An algebra-based, introductory college-level physics course that explores topics such as thermodynamics with kinetic theory; PV diagrams and probability; electrostatics; electrical circuits with resistors, capacitors, and non-ideal, real batteries; a detailed study of magnetism and its effects, electromagnetism; physical and geometric optics, standing waves and sound waves, and quantum, atomic, and nuclear physics. Through inquiry-based learning, students will develop scientific critical thinking and reasoning skills. All students enrolled in AP Physics

2 will be required to take the AP Exam in May.

Prerequisite(s): AP Physics I

Grade(s): 11, 12

Credit: 1

Meets: 7.5 periods weekly

4437: Advanced Placement Physics C: Mechanics

This is a calculus-based physics course that is equivalent to a semester of college-level work in mechanics. Instruction and laboratory experiences will be provided in the following content areas: kinematics; Newton's laws of motion; work, energy, and power; systems of particles and linear momentum; circular motion and rotation; and oscillations and gravitation. AP Physics C is intended to enhance and extend many of the topics and lab activities that the students experienced in their first physics course while providing the opportunity to earn college credit. Since much of it involves the use of introductory differential and integral calculus, it is strongly recommended that the students take an AP calculus BC course either prior to, or concurrently with, AP Physics C. All Students will take the AP examination as the conclusion of this course.

Prerequisite(s): AP Physics I, AB or BC Calculus (may be taken concurrently)

Grade(s): 12

Credit: 1

Meets: 7.5 periods weekly

4447: Advanced Placement Environmental Science

Advanced Placement Environmental Science is designed to be the equivalent of an introductory college course in Environmental Science. Environmental science is the study of the natural sciences in an interdisciplinary context that always includes people and how they influence the system. It includes many aspects of biology, earth science, fundamental

principles of chemistry and physics. This course will provide students with the scientific principles, concepts, and methodologies required to understand the interrelationships of the natural world, to identify and analyze environmental problems both natural and man-made, to evaluate the relative risks associated with these problems, and to examine alternative solutions for resolving and/or preventing them. Topics include scientific analysis, interdependence of earth systems, human population dynamics, renewable and nonrenewable resources, environmental quality, global changes and their consequences, environment and society. Field and laboratory investigations are an integral part of curriculum. All students take the Advanced Placement Examination at the conclusion of the course.

Prerequisite(s): Regents Chemistry

Grades: 11, 12

Credit: 1

Meets: 7.5 periods weekly

4457: Advanced Placement Biology

AP Biology is equivalent to a two-semester college biology course. Students cultivate their understanding of biology through inquiry-based investigations as they explore the following topics: evolution, cellular processes—energy and communication, genetics, information transfer, ecology, and interactions. The key concepts that define the AP Biology course and exam are organized around a few underlying principles called the big ideas, which encompass the core scientific principles, theories and processes governing living organisms and biological systems.

- Big Idea 1: Evolution - The process of evolution drives the diversity and unity of life.
- Big Idea 2: Cellular Processes: Energy and Communication - Biological systems utilize free energy and molecular building blocks to grow, to reproduce, and to maintain dynamic homeostasis.
- Big Idea 3: Genetics and Information Transfer - Living systems store, retrieve, transmit, and respond to information essential to life processes.
- Big Idea 4: Interactions - Biological systems interact, and these systems and their interactions possess complex properties

Prerequisite(s): Successful completion of Living Environment/ Life Science: Biology and Regents Chemistry

Grade(s): 10, 11, 12

Credit: 1

Meets: 7.5 periods weekly

4467: Advanced Placement Chemistry

The Advanced Placement Chemistry course is designed to be the equivalent of the General Chemistry course usually taken during the first year of college. The course stresses the development of student abilities to think clearly and logically and to express their ideas orally and in written form. Topics include structure of matter, kinetic theory of gasses, chemical equilibria, chemical kinetics, the basic concepts of thermodynamics, and descriptive chemistry. Laboratory work is an important component of the course requirement. Students must have

successfully completed Regents Chemistry to manage this level of study. All students take the Advanced Placement Examination at the conclusion of the course.

Prerequisite(s): Regents Chemistry, Algebra 2 (or concurrent)

Grade(s): 11, 12

Credit: 1

Meets: 7.5 periods weekly

2811: Introduction to Research 9

Introduction to Research seeks to accomplish two objectives. One objective is to provide 9th graders with a sense of what it means to participate in the high school research program that begins in the 10th grade in either science or social science. The second objective is to teach 9th graders the basic skills in research and presentation, both written and oral, which are fundamental to academic success in high school, college and beyond. Those skills include: 1. How to evaluate the validity of websites. 2. How to utilize the High School Library's electronic databases. 3. How to build a bibliography. 4. How to write a science or social science research paper. 5. How to make an effective oral presentation. 6. How to use a spreadsheet program to create charts and graphs.

Prerequisite(s): None

Grade(s): 9

Credit: .5

Meets: 5 periods weekly

4521: Science Research 10 (Beginning Research Course in Science)

The student will opt for a Beginning Research Course in the sciences, or social sciences. The instructional component of the course will focus on research methods and practices including, but not limited to such topics as: literature searches, bibliography development, choosing a research question, developing hypotheses, research paradigms, data collection, data analysis, communication of results, written abstracts, experimentation, scientific projects, presentations, and “hands-on” research completed in house, at university, hospital, government lab etc. The hands-on component of the course will involve the development of projects suitable for entry into a variety of competitions. This course is a prerequisite for remaining in the Research Program. Students shall also enter non- data driven competitions, fairs, or projects including but not limited to, the DUPONT Challenge, Toshiba ExploraVision, Young Naturalist Competition, MIT Think, Protein Challenge, Brain Bee and the National Science Bowl.

Prerequisite(s): None

Grade(s): 10

Credit: 1

Meets: 5 periods weekly

4531: Science Research 11 (Intermediate Research Course in Science)

The instructional component of the eleventh grade course would focus on: advanced research design, advanced data analysis and statistics, and research ethics. The hands-on component will be geared toward the design and execution of a project idea for investigation by the student, and hopefully lead to an "Intel level" research project. As appropriate, time will also be spent in the establishment of connections between students and professional mentors who will assist in the guidance of students as they perform their research. Eleventh grade students will be required to enter their research projects in a minimum of four research fairs and contests. The Intermediate Research Course and university level research during the summer between 11th and 12th grades are prerequisites for continuing in the Research Program.

Prerequisite(s): Science Research 10

Grade(s): 11

Credit: 1

Meets: 5 periods weekly

4541: Science Research 12 (*Advanced Research Course in Science*)

In Senior Year, students will complete their research projects, then write their research papers and prepare presentation materials. They will enter the senior level contests appropriate to their area of study, such as the Siemens Competition, the Intel Science Talent Search, SUNY Stony Brook's Junior Science and Humanities Symposium, Long Island Science and Engineering Fair, Long Island Science Congress, Manhattanville College Science Competition/Fair, Research Association Invitational, New York State Science and Engineering Fair, and the International Sustainable World-Energy, Engineering, and Environmental Project. Fall Semester.

Prerequisite(s): Science Research 11

Grade(s): 12

Credit: 0.5

Meets: 5 periods weekly

4611: Anatomy & Physiology

This is a comprehensive course devoted to the study of the structure and function of the human body. In addition to learning how our bodies normally work, we will study the many diseases and disorders with each system. This course is intended to prepare students for college biology or pre-profession, including medicine, veterinary medicine, physical and occupational therapies, nursing, cancer research, biotechnology, and molecular biology. A substantial portion of this course will be devoted to meaningful, hands-on laboratory experiences that include dissecting the fetal pig. With our new addition of the Anatomage Table, students are able to visualize a human body through a 3 dimensional, touch screen computer. This table is life size with tools to do a virtual dissection, allowing the students to see how the body systems and tissues are built upon one another, as well as allowing the learner to experience special features including blood pumping through the vascular system to the organs, pathology of a tumor, medical imaging scans, and a pregnant mother with her fetus. We will use the table to identify, review with games, and show how the body is built, system by system.

Prerequisite(s): Living Environment or Biology

Grade(s): 11, 12
Credit: 1
Meets: 5 periods weekly

4621: Astronomy

Astronomy is an introductory class that is modeled after an early college elective course in the Earth and Space Sciences, designed for students with a natural curiosity for understanding what we observe in our night sky and beyond, as well as what we experience below our feet. This course explores a broad range of topics including the history of space exploration, understanding Earth's geological processes, the fate of the sun, Einstein's theory of special relativity, black holes, and the roles of dark matter and energy in the formation of the universe. Students will be introduced to present theories about the composition, formation, and evolution of moons, planets, stars, galaxies, and the universe. Learnings will benefit students in their recognition, conceptualization and appreciation of our cosmic place in time and space, enhancing the quality of their lives while preparing them for a lower-level college curriculum in the natural and physical sciences.

Prerequisite(s): Regents Chemistry
Grade(s): 11, 12
Credit: 1
Meets: 5 periods weekly

4631: Forensics

Forensic Science is a unique and interesting forum to incorporate many different areas of science with real world technology and the criminal justice system. This challenging course will expose students to many new technological advances in forensic medicine and crime solving techniques like DNA Fingerprinting, serology, toxicology, and organic analysis intertwined with "tried and true" scientific processes. This hands-on course will focus on scientific inquiry, logical thinking skills and problem solving procedures to understand how science can be crucial in solving crimes and how this information is gathered and used in a court of law. This course will combine many types of teaching strategies including scientific inquiry, hands-on laboratories, use of the Internet and libraries for research papers, field trips, guest speakers, and "murder mystery" scenarios that encourage students to utilize their knowledge learned in class to "solve a crime."

Prerequisite(s): Chemistry or Discrete Chemistry
Grade(s): 12
Credit: 1
Meets: 7.5 periods weekly

4711: The Science & Business of Agriculture (formerly Agriscience 1)

This is an interdisciplinary course that explores science, business, and family and consumer science curriculum. It is a hands-on, project-based course focusing on topics including gardening, farming, botany, hospitality management, and food science. The course seeks to

analyze these topics all the while considering the impacts of technology, culture, and externalities. Students will develop understandings of natural and agricultural sciences, evaluate impacts of agricultural practices on output and the environment, and create outdoor gardens conducive to plant growth. This course will review and evaluate the food system and industries surrounding it, agriculture business systems, and food entrepreneurship while considering environmental, societal, and corporate governance. Students will have the opportunity to research the cultural heritage and relevance of food and the role it plays in communities. By leveraging an interdisciplinary co-teaching model, the course will highlight the intersections of these three content areas while engaging students in authentic learning experiences.

Prerequisite(s): None

Grades: 9, 10, 11, 12

Credit: 1

Meets: 5 periods weekly