# Science Courses
Grades 8-12 | 2017-2018

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## SEMESTER ELECTIVES
- Astronomy
- Environmental Science I
- Marine Biology
- Meteorology
- Molecular Biology Lab Techniques
- Experimental Design & Analysis

## FULL YEAR ELECTIVES
- AP Physics
- AP Chemistry
- AP Biology
- AP Environmental Science
- Anatomy & Physiology H
- Research & Sem in Bio Science H

## QUARTER ELECTIVES
- Contemporary Issues (Hybrid)
- Forensic Science
The recommended science course sequence is:

- Biology (9th Grade)
- Chemistry (10th Grade)
- Physics (11th Grade)
- Electives (12th Grade)

All students are required to successfully complete a minimum of three years of a lab science course to meet NJ graduation requirements. All students must take a biology course. Students taking a biology course for the first time will be required to take the NJ Biology Competency Test (NJBCT) in order to graduate. Students will continue their science education with courses in chemistry, physics, environmental science, or Earth and space science. Courses meeting these graduation requirements are denoted in the course listings (with NJ). More than ninety percent of East Brunswick students take a fourth year of science.

The Science Department offers a sequence of courses at the Academic and Honors levels, as well as enrichment electives and AP courses. The courses are designed to provide meaningful, viable choices at each grade level for all interest and skill levels. Student career goals play a major part in the development of the science curriculum. The goal of academic courses is to provide a strong foundation for students so they can be successful in any of the entry-level science courses chosen in college. The Honors sequence enables students to take achievement tests, such as the SAT subject tests. The enrichment electives make students aware of the applications of science. Several courses, as noted in the course listings, can be taken for college credit from Middlesex County College.

*A waiver form, signed by the Science Supervisor or Science Department Chairperson must be used for any variations from the prerequisites stated in this guide for grade 9-12 courses, including taking courses in summer school for advancement and taking two full-year science courses concurrently. Serious consideration should be made when submitting waiver requests due to the commitment that is necessary when taking an academically demanding schedule. Waiver forms are provided by your School Counselor and are due on or before April 7, 2017 in order to be accepted for the following school year.

Science courses are offered in the following formats:

a. 8th grade science courses meet for five (5) single periods during a five (5) day cycle for a full year for 5 credits.

b. Honors & AP: Grade 9-12 full-year courses meet for seven (7) periods during a five (5) day cycle (three (3) single periods and two (2) double lab periods) for 7 credits.

c. Academic: Grade 9-12 full-year courses meet for six (6) periods during a five (5) day cycle (four (4) single periods and one (1) double lab period) for 6 credits.

d. Semester Electives: Grade 10-12 semester courses meet for five (5) single periods during a five (5) day cycle for 2.5 credits.

e. Quarter Electives: Grade 10-12 quarter courses meet for five (5) single periods during a five (5) day cycle for 1.25 credits.
f. Research Seminar (Waksman): Grade 11-12 full-year course that meets for three (3) single periods in a five (5) day cycle for 3 credits.

g. Hybrid Elective: Grade 10-12 quarter course combines face-to-face meetings with independent online work for 1.25 credits.

Refer to the East Brunswick Public Schools Science Curriculum website for more information.

Churchill Junior High School Courses

8th Grade Honors Placement

A matrix is used to determine eligibility for Science 8 Honors. The matrix includes common assessment data from Grade 7 Science, standardized tests and teacher recommendation.

**Grade 8**

**2106 – Science 8 A**

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Science 8 Academic is a full-year course designed to provide students with a basic understanding of chemistry, geology, astronomy and meteorology. Students participate in small-group, cooperative learning activities, as well as large-group discussions. This course frequently uses an inquiry approach where students generate questions and revise their thinking as their understandings of scientific concepts are refined. Laboratory skills, data analysis, practical application, and critical thinking using the scientific process are emphasized throughout the course, as well as writing scientific arguments using the claims, evidence, reasoning paradigm.

**2108 – Science 8 H**

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<th>Grade 8</th>
<th>Co-requisite: Algebra I H or Geometry with Trigonometry H</th>
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Science 8 Honors is a full-year course designed to initiate the serious science student's explorations into chemistry, geology, astronomy and meteorology. The course frequently uses an inquiry approach where students are constructing their knowledge of basic scientific concepts through small-group, cooperative learning activities and laboratory experiences. Laboratory skills, data analysis, practical application, and critical thinking using the scientific process are emphasized throughout the course, as well as writing scientific arguments using the claims, evidence, reasoning paradigm. This course differs from Academic 8th Grade Science by an accelerated pace and increased depth and breadth of content.

**Grade 9**

**2110 - Biology A**

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Academic Biology introduces students to broad aspects of the biological sciences including the structure and function of matter and organisms, inheritance and variation of traits in living things, organisms and their interdependent relationships including the effects of humans on the environment, natural selection and evolution. Students experience a variety of learning strategies, including cooperative group interaction, discussion, demonstration and laboratory experimentation. In all of these activities students incorporate content into their critical thinking. Students are required to take the NJ Biology Competency Test (NJBTC) that is administered in the May of the year they take the course.

*Meets NCAA Core Course Requirements*
2111 - Biology H<sup>NJ</sup>

Grades: 

Prerequisites: B- or better in Honors-level math courses or A- or better in Academic-level math courses, from Algebra I to present course. B- or better in Science 8 H or A- or better in Science 8 A.

Honors Biology, which provides a rigorous, intensive study of Biology, is designed for students who have done exemplary work in the previous year's science class. This course is geared to those students who have strong science skills, high motivation, and who have exhibited the ability to analyze data critically and arrive at meaningful conclusions. Topics of study include the structure and function of matter and organisms, inheritance and variation of traits in living things, organisms and their interdependent relationships including the effects of humans on the environment, natural selection and evolution. The students continuously engage in critical-thinking activities, analysis of data, and the written presentation of logical conclusions during the extensive laboratory activities. Students are required to take the NJ Biology Competency Test (NJBCT) that is administered in the May of the year they take the course.

Meets NCAA Core Course Requirements*

East Brunswick High School Courses

College-Preparatory Sequence

1107 - Biology A<sup>NJ</sup>

Academic Biology introduces students to broad aspects of the biological sciences including the structure and function of matter and organisms, inheritance and variation of traits in living things, organisms and their interdependent relationships including the effects of humans on the environment, natural selection and evolution. Students experience a variety of learning strategies, including cooperative group interaction, discussion, demonstration and laboratory experimentation. In all of these activities students incorporate content into their critical thinking. Students are required to take the NJ Biology Competency Test (NJBCT) that is administered in the May of the year they take the course.

Meets NCAA Core Course Requirements*

1113 - Chemistry<sup>NJ</sup>

Grades: 

Prerequisite: Algebra I

Chemistry focuses on a qualitative understanding of introductory chemistry concepts. This conceptual chemistry course is designed for students who are still developing their mathematical skills and applying those skills to science content. Topics include atomic theory, radiation, periodic table, bonding, chemical reactions, thermochemistry, acids and bases, and nuclear chemistry. This course emphasizes the application of chemistry to authentic scenarios, so students appreciate the important role that chemistry plays in their lives. Critical thinking, data analysis, group projects and cooperative learning activities are included in this course, along with laboratory activities that enhance the understanding of chemistry concepts.

Meets NCAA Core Course Requirements*

1114 - Chemistry A<sup>NJ</sup>

Prerequisites: C+ or better in Algebra I and all succeeding math classes. C- or better in Biology A or Biology H.

Academic Chemistry is designed for students who have exhibited past success in mathematics and science and may continue their study of science in college. This course provides a comprehensive study of the basic concepts of chemistry, which will enhance the student's success in a college chemistry course. Topics include both qualitative and quantitative concepts, such as atomic theory, periodic table trends, bonding, chemical reactions, thermochemistry, kinetic theory of gases, mole theory and stoichiometry, acids and bases, and nuclear chemistry. Numerous laboratory sessions are provided to enhance understanding of chemistry concepts and theory. Critical analysis of data and problem solving are the major thrusts of this course.

Meets NCAA Core Course Requirements*
1128 - Physics NJ

Prerequisites: Biology, Chemistry; Co-requisite: Algebra II

This course centers on the conceptual study of physics. Topics include motion, forces, work and energy, momentum, electricity, magnetism, sound, waves, and light. Students will collect data and analyze it qualitatively and graphically to arrive at scientific conclusions. This program includes presentations, projects, small-group work, laboratory investigations, and problem-based inquiry approaches. Many different learning strategies are employed to assist students of all abilities in developing group skills and scientific knowledge that will prepare them for continued study in the sciences.

Meets NCAA Core Course Requirements*

1127 - Physics AW

Prerequisites: C or better in Algebra II and all succeeding math courses. C or better in Chemistry A or Chemistry H.

Academic Physics provides a comprehensive study of the basic concepts of Physics. Topics include kinematics, dynamics, momentum, work and energy, electrostatics, circuits, magnetism, wave behavior, sound, and light. Numerous laboratory experiences enhance student understanding of the basic physical concepts which govern the physical universe. All topics involve applying math skills to critical-thinking and problem-solving activities in science, such as the graphical analysis of motion and vector analysis in force problems.

Meets NCAA Core Course Requirements*

Honors/Advanced Placement Sequence

1112 – AP Biology

Prerequisites: B- or better in Biology H or A- or better in Biology A. C+ or better in Chemistry H or B+ or better in Chemistry A.

1143 – Anatomy and Physiology H*

Prerequisites: C+ or better in Biology H or B+ or better in Biology A. C or better in Chemistry H or B or better in Chemistry A.

Anatomy and Physiology is designed to introduce students to the structure and function of the human body. The scope of the course includes topics such as animal cell structure and biochemistry, tissue organization and function, and mammalian organs and organ systems as they relate to human biology. Extensive laboratory work, including a major mammalian dissection, is required. The course provides a strong background for students entering careers such
as nursing, medical technology, and sports medicine. See College Pathways Dual Enrollment Program for information about earning MCC credits.

Meets NCAA Core Course Requirements*

Course Guide [.pdf]

1121 - Chemistry \(H^N\)

Prerequisite: B or better in Biology H or A- or better in Biology A. B or better in Honors-level math courses or A or better in Academic-level math courses, from Algebra I to present course. Co-requisite: Algebra II Honors or higher

| [Fall] MCC Course: CHM-121/125 – General Chemistry I with Lab [4 credits] |
| [Spring] MCC Course: CHM-122/126 General Chemistry II with Lab [4 credits] |
This EBHS course provides the opportunity for students to earn up to [8] college credits

Honors Chemistry is a quantitative approach to the study of the basic concepts of chemistry. The topics of study include atomic theory, periodic table trends, bonding, chemical reactions, mole theory, stoichiometry, gases, solutions, thermochemistry, kinetics, equilibrium, thermodynamics, acids and bases, and electrochemistry. The major emphasis of Honors Chemistry is on critical thinking and reasoning based on data gathered in laboratory experiences. Problem-solving activities are an integral part of the course. See College Experience Dual Enrollment Program for information about earning MCC credits.

Meets NCAA Core Course Requirements*

1126 - AP Chemistry

Prerequisites: B or better in Honors-level math courses or A or better in Academic-level math courses, from Pre-Calculus to present course. B or better in Chemistry H, or A or better in Chemistry A. Co-requisite: Physics A or Physics H.

AP Chemistry is designed for second-year chemistry students who have high motivation and plan to enter a science-related career. The course provides a rigorous quantitative approach to advanced topics of chemistry in preparation for the Advanced Placement exam in chemistry. The course begins with a review of basic concepts, then progresses to kinetics, equilibrium, electrochemistry, thermodynamics, quantum mechanics, and radioactivity. Numerous laboratory experiences are included in the course. Students who have previously taken Academic Chemistry will have extensive work to complete before starting this course to learn topics not included in their entry-level chemistry course.

Meets NCAA Core Course Requirements*

1134 – Physics \(H^N\)

Prerequisites: B- or better in Honors-level math courses or A or better in Academic-level math courses, from Algebra II to present course. B- or better in Chemistry H or A- or better in Chemistry A.

| [Fall] MCC Course: PHY-123/125 – General Physics I with Lab [4 credits] |
| [Spring] MCC Course: PHY-124/126 General Physics II with Lab [4 credits] |
This EBHS course provides the opportunity for students to earn up to [8] college credits

Honors Physics provides a rigorous mathematical study of physics, including topics such as translational and curvilinear motion, mechanics, momentum, simple harmonic motion, torque, energy, gravitation, electrostatics, circuits, magnetism, wave behavior, light and sound. Mathematical and graphical methods of vector analysis are used to describe and analyze the dynamics of physical phenomena. Students perform mathematical and computer analysis of data during the numerous laboratory activities. The concepts are studied theoretically and in the laboratory to reinforce student understanding. Students will use critical-analysis and problem-solving skills extensively. See College Experience Dual Enrollment Program for information about earning MCC credits.

Meets NCAA Core Course Requirements*
1141 - AP Physics
Prerequisite: B or better in Physics H or A or better in Physics A. Co-requisite: AP Calculus or higher.
7-7
AP Physics is a course for highly motivated science students who are considering a science-related career. This course is a Calculus-based, mathematically rigorous study of physics designed to prepare the student for the AP Physics C examinations in both mechanics and electricity and magnetism. Students gain expertise in the mathematical analysis of physical phenomena that is not possible in a first-year physics course. There is an emphasis on solving sophisticated physics problems. Laboratory experiences are provided to help students understand some of the more abstract concepts. Students who have previously taken Academic Physics will have extensive work to complete before starting this course to learn topics not included in their entry-level physics course.
Meets NCAA Core Course Requirements*

1144 - AP Environmental Science
Prerequisites: C+ or better in Biology H or B+ or better in Biology A. C or better in Chemistry H or B or better in Chemistry A.
The goal of AP Environmental Science is to equip students with the scientific knowledge necessary for understanding the interrelationships in the natural world. This course provides students with the skills necessary to analyze environmental problems and the relative risks associated with human changes to natural ecosystems. Students will also examine alternative solutions to solving these problems. AP Environmental Science is an interdisciplinary course that incorporates scientific principles from earth science, biology and chemistry, in addition to aspects of social studies, as they relate to the study of the environment. Students in this course are expected to attend several field trips that take place during school hours.
Meets NCAA Core Course Requirements*

1142 - Research and Seminars in Biological Science
Prerequisite: Biology H or Biology A. Molecular Biology Lab Techniques (1140) Passing grade for each semester of Research and Seminars in Biological Science H, if previously taken.
3-3
The Waksman Student Scholars Program provides opportunities for students to conduct an authentic research project in molecular biology and bioinformatics. Students use molecular biology laboratory techniques to isolate and analyze DNA samples. The goal is for students to analyze, and possibly publish, a DNA sequence. Note that this program is affiliated with Rutgers University, which sets course requirements and limitations. This is a full-year course that meets three (3) days a week after school; attendance is mandatory. This course can be taken more than once in a High School career; qualified students take on leadership roles as they progress in the program.
Meets NCAA Core Course Requirements*

Science Enrichment Electives

1102 - Environmental Studies
Semester Course; Prerequisite: Biology A or Biology H.
5-2.5
Environmental Studies I is designed to enhance student understanding of the complex dynamics that occur between the living and non-living factors on earth that together shape our environment. It is also designed to illustrate human involvement in this ongoing process and to stimulate the development of an environmental awareness that can help the student become a responsible member of our society. Environmental Studies I focuses on a series of topics that can be summarized as ecology and resources, with an emphasis on evaluating the human impact on the environment in the past, present, and future. In addition, students explore, propose, and implement possible solutions to current environmental concerns.
Meets NCAA Core Course Requirements*
1104 - Contemporary Issues of Science

*Quarter/Hybrid Course* 5-1.25

This is a **non-laboratory course** concerned with the cultural, global and humanistic aspects of science. Students analyze how science is a major part of our culture and the role that scientists must play together with sociologists in solving world problems. Topic choices are current in scope and student-interest driven. Example topics could include environmental issues, energy use and resources, genetic engineering, biodiversity, and food additives and contaminants. Individual and cooperative learning activities allow students to examine information, present various opinions and discuss the topic in class. This course is a hybrid course, so it includes class meetings each week along with independent, online activities. This course is offered quarterly with a different theme each quarter, so students can enroll in this course for multiple quarters during a school year.

*Meets NCAA Core Course Requirements*

1105 - Astronomy

*Semester Course* 5-2.5

This is a course designed to give students a basic understanding of the structure of the universe, the structure and behavior of the objects that make up the universe and the earth's relationship to the other objects in our solar system. It includes a detailed study of the planets, the sun and the moon. Modern observational and measurement methods used by astronomers are investigated.

*Meets NCAA Core Course Requirements*

1106 - Meteorology

*Semester Course* 5-2.5

This is a course designed to give students a basic understanding of weather patterns and their causes. The students observe weather and cloud formations, rain, snow, sleet, and wind. The causes and effects of major storms and the instruments used to measure and predict weather are examined. Major aspects of the course include the prediction of tornadoes, hurricanes, and other weather conditions. Students engage in weather forecasting, collecting daily weather data, and preparing and decoding the daily weather map. Weather data, which is computer generated, is also analyzed by students.

*Meets NCAA Core Course Requirements*

1101 - Marine Biology

*Semester Course; Prerequisite: Biology A or Biology H* 5-2.5

Marine Biology focuses on the study of marine ecosystems with specific emphasis on the ecology of the Atlantic coastal waters. This course involves the study of physical and chemical processes and their influence on the distribution and abundance of marine organisms. Specific ecosystems include coral reefs, kelp forests, rocky intertidal, estuaries, deep sea, and sandy beaches. Students are introduced to vertebrates and invertebrates that inhabit these ecosystems, such as fish, marine mammals, mollusks, cnidarians, poriferans, arthropods, and echinoderms. The impact of humans on these natural ecosystems is also studied. In addition, students explore career options in the field of marine sciences.

*Meets NCAA Core Course Requirements*

1130 - Forensic Science 1

*Quarter Course; Prerequisites: Biology A or Biology H* 5-1.25

1131 - Forensic Science 2

*Quarter Course; Prerequisites: Biology A or Biology H* 5-1.25

1132 - Forensic Science 3

*Quarter Course; Prerequisites: Biology A or Biology H* 5-1.25

1133 - Forensic Science 4

*Quarter Course; Prerequisites: Biology A or Biology H* 5-1.25

Students in this course learn the fundamentals of a criminal investigation and how it is used in a court of law. All sessions include crime scene analysis, evidence collection, and case studies. Each quarter will focus on specific analytical techniques
that could include fingerprinting, ballistics, explosives, arson, DNA, blood spatter, hair, fiber, handwriting analysis, forensic anthropology, and toxicology. By stepping into the role of the forensic scientist, students learn and apply numerous scientific strategies and skills. Students can take one quarter or multiple quarters of this course in any order; each quarter will focus on different analytical techniques.

Meets NCAA Core Course Requirements*

**1140 - Molecular Biology Lab Techniques**

*Semester Course; Prerequisite: Biology H or Biology A*  
5-2.5

Students in this semester course get an introduction to using molecular biology laboratory protocols, such as DNA purification, PCR, restriction digests, and agarose gel electrophoresis, to isolate and analyze DNA samples. This course is a prerequisite for the Waksman Student Scholars Program (course 1142) where students conduct a molecular biology research project.

Meets NCAA Core Course Requirements*

**1146 - Experimental Design & Analysis**

*Semester Course; Prerequisite: Biology H or Biology A, Co-requisite: Algebra II*  
5-2.5

This course is designed for students who want to conduct individual or group research on a chosen topic. Students will get an introduction to the skills necessary to conduct independent scientific research, including how to find, read, and examine published scientific papers, develop testable research questions, design and conduct experiments, use statistics to analyze experimental results, and document and present their findings.

Meets NCAA Core Course Requirements*

*This course meets the NCAA core course requirements - see Section II, p. 18 for explanation.