

**EAST LONGMEADOW HIGH SCHOOL
SCIENCE PROGRAM OF STUDIES**

ADVANCED PLACEMENT BIOLOGY

GRADE	CREDITS
11, 12	8

Prerequisite: A grade of "B-" or better in both Honors Biology/Biology and Honors Chemistry/Chemistry.
A grade of "B-" or better in Algebra II.
It is strongly recommended that students take Anatomy & Physiology prior to or concurrently.
Departmental approval is strongly recommended.
Completion of a summer assignment is required.

Advanced Placement Biology is a full-year course and is the equivalent of a college-level biology course for biology majors. The curriculum is mandated by the Advanced Placement Examination, underwritten by the College Board. The Course is intended to be the equivalent of a two-semester college course usually taken by biology majors during their first year. Upon successful completion of the course, some students may waive their freshmen college or university biology Prerequisites. The broad curriculum areas include ecology, animal behavior, biochemistry and cell biology; cell energetics; genetics and biotechnology; evolution and diversity; and structure and function of organisms. Evaluation methods include quizzes, examinations, supplemental reading assignments, essays, presentations, projects and laboratory reports based on data collected by students. The laboratory investigations will provide a strong background in research techniques to be used in future college biology courses, while also providing hands-on examples of the topics discussed in lecture. Students are expected to take the Advanced Placement Biology examination in May.

Basic Text: Biology. Campbell and Reece

BIOLOGY

GRADE	CREDITS
9, 10	4

This course provides a molecular approach to help students understand current scientific thinking and to assist them to learn traditional biological content that has been aligned to the state Biology standards. The biological topics include Evolution and Biodiversity, Biochemistry and Cell lecture, laboratory investigations, projects and presentations. Students will be evaluated on the basis of quizzes, tests, laboratory reports, written homework assignments, projects, and classroom participation.

Students are required to take the MCAS Biology exam at the end of the course.

Basic Text: Biology: Miller and Levine

HONORS BIOLOGY

GRADE	CREDITS
9, 10	4

Prerequisite: A grade of “B+” or better in Grade 8 Science.

This course is designed for students who have both a strong interest and have demonstrated aptitude in science. This fast paced course is intended for students who plan to take AP science courses. Concepts in Biology and related areas of science will be explored in greater depth and in a more challenging manner. The course is intended to provide motivated students with a sophisticated knowledge of biology and to sharpen their independent learning and higher order thinking skills.

Honors Biology is aligned to the Massachusetts state frameworks in Biology. The threads of molecular biology and evolution by natural selection are tied together as the emphasis is gradually shifted from molecules to cells, individuals, populations and eventually to the biosphere. This course provides students with knowledge of and insights into molecular biology that enable them to better understand how the rapid advances in biology will affect their lives in the twenty-first century. Additional topics to be covered will include characteristics of organisms, evolution of life, principles of heredity, matter and energy in ecosystems and human anatomy and physiology.

Students will be evaluated on the basis of quizzes, tests, laboratory reports, written homework assignments, oral presentations, projects and lab based assessments. It is expected that each student is an active participant in all aspects of the class.

Basic Text: Biology, Mader.

HONORS HUMAN ANATOMY AND PHYSIOLOGY

GRADE	CREDITS
10, 11, 12	4

Prerequisite: A grade of “C-“ or better in Honors Biology/Honors Chemistry or “B-“ or better in Biology/Chemistry.

This honors level course is intended to give students an opportunity to study, using college level curriculum materials, the structure, function and processes of the human organism. Students contemplating further study in nursing, medicine, medical technology, biotechnology and other science careers should find Human Anatomy and Physiology extremely valuable in preparing for college. Even though this course is designed with scientific and biomedical careers in mind, other students wishing to learn about anatomy and physiology in an appropriately challenging classroom environment will find this exciting course both interesting and useful.

Human Anatomy and Physiology begins with an introduction to the organization of the human body followed with a fast paced review of cell structure and function and an introduction to tissues. Each organ system is then thoroughly investigated and studied. This material is covered by means of classroom lecture and discussion as well as frequent laboratory exercises including some dissections. Daily reading assignments also help the student to become familiar with the material to be covered in class the next day. Student evaluations will be based upon examinations, frequent quizzes, lab reports, and PowerPoint presentations.

Basic Text: Human Anatomy and Physiology. Hole

HUMAN ANATOMY AND PHYSIOLOGY

GRADE	CREDITS
11, 12	4

Prerequisite: A "C-" or better in Biology and Chemistry or teacher approval.

This course is intended to give students an opportunity to study the structure, function, and process of the human organism. Students contemplating further study in scientific or biomedical careers should find this course extremely valuable in preparing for college.

Human Anatomy and Physiology begins with an introduction to the organization of the human body and tissues. Selected body systems will be thoroughly investigated and studied. This material is covered by means of classroom lecture and discussion as well as frequent laboratory exercises including some dissections. Daily reading assignments also help the student to become familiar with the material to be covered in class the next day.

Student evaluations will be based upon examinations, frequent quizzes, class work, homework and lab reports.

Text: Structure and Function of the Body, (13th Ed.) Thibodeau & Patton

ADVANCED PLACEMENT CHEMISTRY

GRADE	CREDITS
11, 12	8

Prerequisite: A grade of a B or better in Honors Chemistry or Chemistry, and a grade of a B- or better in Algebra II. Departmental approval is strongly recommended and some prerequisite summer activities may be required.

This full-year course is designed to be the equivalent of the general chemistry course usually taken during the first year of college. For most students, the course enables them to undertake, as a freshman, second year work in the chemistry sequence at their institution or to register in courses in other fields where general chemistry is a prerequisite. This course is structured around the six big ideas articulated in the AP Chemistry curriculum framework provided by the College Board. The six big ideas are as follows: 1) The chemical elements are fundamental building materials of matter, and all matter can be understood in terms of arrangements of atoms. These atoms retain their identity in chemical reactions. 2) Chemical and physical properties of materials can be explained by the structure and arrangements of atoms, ions, or molecules and the forces between them. 3) Changes in matter involve the rearrangement and/or reorganization of atoms and/or the transfer of electrons. 4) Rates of chemical reactions are determined by details of the molecular collisions. 5) The laws of thermodynamics describe the essential role of energy and explain and predict the direction of changes in matter. 6) Any bond or intermolecular attraction that can be formed can be broken. These two processes are in a dynamic competition, sensitive to initial conditions and external perturbations.

Students will be graded primarily on the basis of performance on tests and laboratory work.

BasicText: Chemistry and Chemical Reactivity; 6th edition. Kotz, Triechel, and Weaver

CHEMISTRY

GRADE	CREDITS
10, 11, 12	4

Prerequisite: A grade of "C-" or better in Algebra 1 and a "C-" or better in Biology or Honors Biology.

This is a traditional survey course in chemistry that integrates both the mathematical and reasoning skills needed to understand the behavior of matter at the atomic level. Laboratory experimentation and the development of safe lab techniques and procedures are an essential part of this course.

Topics covered in this course include the classification of matter, chemical reactions and changes in chemical properties and energy, a review of acids, bases and pH, atomic structure, the organization of the periodic table and periodic trends, chemical formulas, nomenclature, chemical equations, stoichiometry, chemical bonding, molecules, chemical compounds, kinetic theory and the gas laws.

Tests, quizzes, lab reports, homework and classroom participation are used to evaluate student performance.

Basic Text: Chemistry: Matter and Change. Glencoe

HONORS CHEMISTRY

GRADE	CREDITS
10, 11	4

Prerequisite: A grade of "B+" in Biology or a "B-" or better in Honors Biology. Concurrent enrollment in Algebra 2 is highly recommended.

This course is designed for sophomores and juniors who have both a strong interest and have demonstrated aptitude in science. This is a fast paced, curriculum driven, honors level course for students who intend to later take AP science courses. Concepts that are normally covered in Chemistry are explored at a depth and level of academic challenge commensurate with an honor level course.

Topics to be investigated include the classification of matter, chemical reactions and changes in chemical properties and energy, a review of acids, bases and pH, atomic structure, the organization of the periodic table and periodic trends, chemical formulas, nomenclature, chemical equations, stoichiometry, chemical bonding, molecules, chemical compounds, kinetic theory and the gas laws.

Tests, quizzes, lab reports, and student classroom participation are used to evaluate student performance.

Basic Texts: Chemistry, 8th edition: Raymond Chang

ADVANCED PLACEMENT PHYSICS 1

GRADE	CREDITS
11, 12	6

Prerequisite: No Pre-requisite required. Students taking AP Physics 1: Algebra-Based are expected to have strong mathematical ability as evidenced in their performance in previous mathematics classes.

AP Physics 1: Algebra-Based is the equivalent of a first-semester college course in algebra-based physics, but is designed to be taught over a full academic year to enable AP students to develop deep understanding of the content and to focus on applying their knowledge through inquiry labs.

The course covers Newtonian mechanics (including rotational dynamics and angular momentum); work, energy, and power; mechanical waves and sound; and electric circuits.

Evaluation of Students: Students will be evaluated based on the following:

Tests:	50%
Quizzes:	20%
Labs:	20%
Homework:	10%

Basic Text: Physics, Wilson and Buffa

ADVANCED PLACEMENT PHYSICS 2

GRADE	CREDITS
11, 12	6

Prerequisite: Grade of B- or better in Physics, Honors Physics, or AP Physics 1: Algebra-Based. In addition, students taking AP Physics 2: Algebra-Based are expected to have strong mathematical ability as evidenced in their performance in previous mathematics classes.

AP Physics 2: Algebra-Based is the equivalent of a second-semester college course in algebra-based physics, but is designed to be taught over a full academic year to enable AP students to develop deep understanding of the content and to focus on applying their knowledge through inquiry labs.

The course covers fluid mechanics; thermodynamics; electricity and magnetism; optics; and atomic and nuclear physics. Evaluation of Students: Students will be evaluated based on the following:

Tests:	50%
Quizzes:	20%
Labs:	20%
Homework:	10%

HONORS PHYSICS

GRADE	CREDITS
10, 11, 12	4

Prerequisite: A grade of “C-“ in Honors Chemistry or “B-“ or better in Chemistry. Concurrent enrollment in Pre-Calculus is highly recommended.

This course is designed for students who have a strong interest and have demonstrated aptitude in science. This is a fast paced course intended for students who will later take AP science courses. Concepts covered in Physics are explored at a depth and level of academic challenge commensurate with an honors level course.

Topics covered include forces and motion, mass and inertia, Newton’s laws of motion, Newton’s law of universal gravitation, waves, heat and heat transfer and electromagnetic radiation.

Tests, quizzes, lab reports, and student classroom participation are used to evaluate student performance.

Text: Holt Physics: Serway and Faughn

PHYSICS

GRADE	CREDITS
10, 11, 12	4

Prerequisite: Successful completion or concurrent enrollment in Algebra II.

Physics is the study of the way the universe works at a fundamental level. A working knowledge of physics is especially useful to students planning to major in science or technical subjects in a four-year college or university after high school. This is because a course in physics is almost always required of these majors. One objective of Physics, therefore, is to provide an understanding of those aspects of physics that will be most useful to students interested in scientific, engineering, or health-related careers. These include: the way things move, Newton's Laws, the forces of nature and concepts of energy.

A secondary objective is to enable each student, including those students who may be undecided about a career, to gain an understanding of the basic rules of nature described by physics. The physical world makes a lot more sense once one knows these basic rules.

The student who takes Physics should have already taken Geometry and should be enrolled in at least Algebra II. Mathematical problem solving will be an important part of this course because math is one of the languages of physics and also because the ability to analyze and solve problems is a requirement for many of today's increasingly technical careers.

Class time will be divided among the following activities: lectures, discussions, and laboratory experiments. Numerous examples from every-day life are used to illustrate the principles of physics.

The main determinant of the grade is the student's test and quiz average. A test or quiz is given almost every week. In addition, laboratory work (including lab reports), effort, and class participation have an effect on the student's grade.

Basic Text: Physics: Principles and Problems. Murphy, Hollon, Zitzewitz and Smoot

ENVIRONMENTAL SCIENCE

GRADE	CREDITS
11, 12	4

Prerequisite: Successful completion of any Biology course and any Chemistry course.

This course is a hands-on integrated science course in which students will further explore relevant areas of biology, chemistry, and physical science.

The curriculum will include the biosphere, ecological interactions, energy, land and water resources, and human impact on the environment.

Students will be evaluated on the basis of quizzes, tests, lab reports, field journals, written homework, oral presentations and long-term projects.

Text: Environmental Science: The Way The World Works, Nebel and Wright

FORENSIC SCIENCE

GRADE	CREDITS
11, 12	4

Prerequisite: Successful completion of a Biology and Chemistry Course.

This course is an introduction to crime scene investigation and evidence gathering. Utilizing lecture and laboratory work students will learn the analysis methods, procedures, techniques, and preservation of crime scene evidence. The course covers topics in respect to biological evidence, chemical and materials evidence, and physical and technological evidence. Students will learn the history of how scientific instrumentation has changed the courtroom. Additional forensic information will be obtained from documented cases and investigations that have reached a dead end (cold case files). Students will be evaluated on the basis of quizzes, tests, laboratory reports, homework assignments, critical thinking exercises, and crime scene analysis.

Text: Introduction to Forensic Science and Criminalistics, McGraw Hill

HONORS FORENSIC SCIENCE

GRADE	CREDITS
11, 12	4

Prerequisite: Successful completion of a Biology and Chemistry Course.

Honor Forensic Science is an introductory course but designed for students who have a strong interest in forensic science, have a demonstrated aptitude in science and technology, and are looking for a challenging and rigorous science course. Topics are arranged similarly to the standard level but a deeper understanding of the trainings and topics are required. Utilizing lecture and laboratory work students will learn the analysis methods, procedures, techniques, and preservation of crime scene evidence. The course covers topics in respect to biological evidence, chemical and materials evidence, and physical and technological evidence. Students will learn the history of how scientific instrumentation has changed the courtroom. Additional

forensic information will be obtained from documented cases and investigations that have reached a dead end (cold case files). Students will be evaluated on the basis of quizzes, tests, laboratory reports, homework assignments, research projects, presentations, critical thinking exercises, and crime scene analysis.

Text: Introduction to Forensic Science and Criminalistics, McGraw Hill