Science Department

Mr. Michael Griffin, Science Department Program Administrator
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Science Graduation Requirement: 3 Years / 15 Credits

Course Title	Level	Course Number	Grade Level	Semester	# of Periods	Credits
STEM Applications S	College Prep	3003	9	All	6	7.5
Science Prep	College Prep	3113	9	All	2	2.5
Physics (Lab)	High Honors	3105	9	All	4	5
Physics (Lab)	Honors	3104	9	All	4	5
Physics (Lab)	College Prep	3103	9	All	4	5
Chemistry (Lab)	High Honors	3305	10	All	4	5
Chemistry (Lab)	Honors	3304	10	All	4	5
Chemistry (Lab)	College Prep	3303	10	All	4	5
Biology (Lab)	High Honors	3205	11	All	4	5
Biology (Lab)	Honors	3204	11	All	4	5
Biology (Lab)	College Prep	3203	11	All	4	5
Anatomy & Physiology (Lab)	College Prep	3503	11-12	All	4	5
Anatomy & Physiology (Lab)	High Honors	3505	11-12	All	4	5
Forensic Science (Lab)	Honors	3604	12	All	4	5
Introduction to Engineering (Lab)	College Prep	3623	12	All	4	5
Introduction to Engineering (Lab)	Honors	3624	12	All	4	5
Marine Biology (Lab)	College Prep	3213	12	All	4	5
Marine Biology (Lab)	Honors	3214	12	All	4	5
A.P. Biology	Advanced Placement	3255	12	All	4	5
AP Chemistry	Advanced Placement	3355	11-12	All	4	5
AP Physics 1&2	Advanced Placement	3405	11-12	All	4	5
AP Environmental Science	Advanced Placement	3605	11-12	All	4	5
AP Physics (C)	Advanced Placement	3415	12	All	4	5
Robotics and Engine. I	College Prep	6313	9-12	All	4	5

Robotics and Engine. I	College Prep	6303	9-12	All	2	2.5
Robotics and Engine. I	Honors	6314	9-12	All	4	5
Robotics and Engine. II	College Prep	6323	9-12	All	4	5
Robotics and Engine. II	Honors	6324	9-12	All	4	5
Robotics and Engine. III	Honors	6334	9-12	All	4	5

Science Program

Science Course Progression by Year & Initial Course Enrollment

Series One		**Series Two**
Physics	Grade 9	Science Explorations
Chemistry	Grade 10	Physics
Biology	Grade 11	Chemistry
Science Elective	Grade 12	Biology

AP and Elective Offerings

First Year Eligible	**Course**	**Course Prerequisite**
Grade 9	Robotics	None
Grade 10	AP Physics 1-2	Physics
Grade 11	AP Chemistry	Chemistry
Grade 12	Anatomy and Physiology	Biology
Grade12	AP Environmental Science	Biology
Grade 12	AP Physics C	Physics and Calculus
Grade 12	Marine Biology	Biology
Grade 12	Forensics	Two years of Science
Grade 12	Intro to Engineering	Two years of Science
Grade 12	AP Biology	Biology

STEM Applications S **College Prep** **Course #3003**
Credits: 7.5 (5 Math, 2.5 Science)
Prerequisites: Teacher Recommendation. Must be enrolled concurrently in the math section
STEM Applications will develop the science and math skills to prepare students for studying math and science topics in the future. This course is designed to help students build a stronger number sense and cultivate the science and engineering practices that are part of the Massachusetts Common Core and Science and Engineering Standards. The course will include algebra and geometry concepts by applying them within the context of experimental design, data collection and analysis, math and science practices, science inquiry, and modeling. ***Students taking this course in grade 9 will take the MCAS exam in grade 10.***

Science Prep **College Prep** **Course # 3113**
Credits: 2.5
Prerequisite: Teacher Recommendation
This course is designed to support students in developing the skills to succeed in science. Instruction will be designed for individual needs and focus on comprehension of material and improving science and engineering practices.

PHYSICS

This course is designed to present topics in mechanics, electricity, magnetism, waves, and heat. It will be taught using a concept-based approach while simultaneously integrating the students mathematical background in order to develop a meaningful physics foundation. The program will be supported by an interactive laboratory environment where students will gain hands-on experience with the concepts being studied. This course is the first in the core science series.

PHYSICS (Lab) High Honors Course # 3105

Prerequisite: Must take concurrently with Geometry

This course will include a more intensive and in-depth study of the topics listed above as well as other topics that are not specifically listed in the Massachusetts state standards. Students selecting this course should have reading skills at grade level and be able to solve problems by applying algebraic methods. It will serve as an important component of college preparatory study.

PHYSICS (Lab) Honors Course # 3104

Prerequisite: Teacher Recommendation

This course will include a more in-depth study of the topics listed above. Students selecting this course should have reading and math skills at grade level. It will serve as an important component of college preparatory study.

PHYSICS (Lab) College Prep Course # 3103

Prerequisite: Teacher Recommendation

This course will concentrate on the State Physics Standards. The program assumes that students are developing basic algebraic skills. It will serve as an important component of college preparatory study.

CHEMISTRY

Chemistry is a course where laboratory experiences are the primary method used to cover topics such as gases, atomic theory, chemical bonding, ionization, electrolytes, bases and acids, chemical equilibrium, introductory electrochemistry, characteristics of chemical reactions, and periodicity of chemical and physical properties. Students selecting this course should have reading skills at grade level and be able to solve problems by applying algebraic methods. Skills that will be developed include chemistry laboratory procedures, writing of laboratory reports, solving chemical problems, and applying chemical principles to everyday living.

CHEMISTRY (Lab) High Honors Course# 3305

Prerequisite: Physics and Teacher recommendation.

This course will include a more intensive and in-depth study of the topics listed above. Students selecting this course should have reading skills at or above grade level and be able to solve problems by applying algebraic methods. For this reason, the instructor will assume that students will be able to solve quantitative problems independently. Students who work successfully in this course are encouraged to take the SAT II (Achievement) Test in Chemistry.

CHEMISTRY (Lab) Honors Course # 3304

Prerequisites: Physics and teacher recommendation.

This course and laboratory component is designed to provide a survey of chemical principles for students who are interested in the subject. It will serve as an important component of college preparatory study. For this reason, the instructor will assume that students will be able to solve problems independently.

CHEMISTRY (Lab) College Prep Course # 3303

Prerequisite: Physics

This course and Laboratory component are designed for students who want a working knowledge of chemical principles. It will stress the basic concepts of chemistry on a conceptual level.

BIOLOGY

The biology courses focus on the following concepts: chemical and cellular basis of life, energy transformations, genetics and biotechnology, evolution and biodiversity, and animal systems. Each topic will be supported by appropriate laboratory experiences. Skills that will be developed in biology include: note taking, collecting data, writing a lab report, reporting on outside reading or projects and test taking.

BIOLOGY (Lab) **High Honors** **Course # 3205**

Prerequisite: Chemistry and teacher recommendation.

Using an independent student centered approach of instruction; this course builds on students prior knowledge of basic biological concepts focusing on application and inquiry. Students selecting this course should have reading skills at or above grade level and be able to work independently.

BIOLOGY (Lab) **Honors** **Course # 3204**

Prerequisite: Chemistry Level 4 or Grade of 90% in Chemistry Level 3 or teacher recommendation.
Using guided instruction this course reviews and deepen students' prior knowledge of basic biological concepts focusing on understanding with some application and inquiry.

BIOLOGY **College Prep** **Course # 3203**

Prerequisite: Chemistry

Using an activity-oriented approach this course will cover the basic biological concepts outlined by the state frameworks. Students selecting this course should have standard reading and writing skills.

SCIENCE ELECTIVE COURSES

ANATOMY & PHYSIOLOGY (Lab) **High Honors** **Course # 3505**
College Prep **Course # 3503**

Prerequisite: Biology & Chemistry and teacher recommendation

This course will concentrate on the anatomy, physiology, and histology of the human systems which include: the skeletal, muscular, integumental, nervous, respiratory, digestive, circulatory, excretory, reproductive systems, as well as endocrinology, and immunology. Students should have above average reading ability. Skills that will be developed in this course include: writing biological abstracts, doing independent research, making better observations, relating structure with function, improved techniques of dissection and microscopy.
Students electing to take High Honors will explore the physiology of these body systems in depth and will be required to complete independent research topics for each unit of study.

MARINE BIOLOGY (Lab) **Honors** **Course # 3214**
MARINE BIOLOGY (Lab) **College Prep** **Course # 3213**

Prerequisite: Grade 12 and Teacher Recommendation

Marine Biology surveys the plants and animals in the ocean, their habitats and how they relate to the changing geological, physical, and chemical properties of the sea. Students should have reading skills at grade level. Skills that will be developed include observation, interpretation and understanding of plant and animal behavior; critical analysis and synthesis of data; and seeking ways to solve problems relating to the marine environment.

FORENSIC SCIENCE (Lab) **Honors** **Course #3604**

Prerequisite: Grade 12 and Teacher Recommendation

This course will explore the science of forensic investigations. Students will investigate and discuss the methods of observing, identifying, collecting, and comparing physical evidence around a crime scene. Analytical techniques both in and out of the classroom will be utilized. Topics that will be addressed include: Crime Scene Investigations, Eyewitness Accounts, Fingerprint Analysis, Hair and Fiber Analysis, Serology, DNA Evidence, and Questioned Documents. This is a lab-based course.

INTRODUCTION TO ENGINEERING (Lab) Honors Course # 3624
INTRODUCTION TO ENGINEERING (Lab) College Prep Course # 3623
Prerequisite: Passing grade of 70% or above in Chemistry, Physics and Biology.
The course introduces students to the skills used in engineering by working in teams to solve technical problems. Students will study technological advances and apply the engineering process. Students enrolled in Level 4 will conduct term projects that require independent research in various aspects of technology. Students enrolled in Level 4 will also do a team-based, independent keystone project that identifies a need and develops a product to meet that need.

ADVANCED PLACEMENT ELECTIVES

Students enrolling in AP must meet all prerequisites and be recommended by their teacher. All AP course syllabi have been approved by the College Board and are held to the standards and rigor set forth by the College Board. (For specific content expectations please visit: apcentral.collegeboard.com or contact Michael Griffin, Science Program Administrator). ALL AP Science courses are equivalent to a College Level Course.

A.P. CHEMISTRY Advanced Placement Course # 3355
Prerequisite: Chemistry and Algebra II and teacher recommendation.
This course is designed to be a college level course. Topics such as the structure of matter, kinetic theory of gases, chemical equilibrium, chemical kinetics and the basic concepts of thermodynamics will be covered in considerable depth. Meaningful laboratory work will help prepare a student for sophomore level chemistry courses in college.

A.P. PHYSICS [C] Advanced Placement Course # 3415
Prerequisite: Physics and taking Calculus concurrently & teacher recommendation.
Physics C covers mechanics, classical electricity and magnetism. These topics are covered in great depth with analytical and mathematical sophistication, including calculus applications. Laboratory experience is an integral part of this course. This college level course is suitable for students planning to specialize in a physical science or in engineering.

A.P. PHYSICS 1 & 2 Advanced Placement Course # 3405
Prerequisite: Physics and teacher recommendation.
This course provides a systemic introduction to the main principles of physics and emphasizes the development of problem-solving ability. Mechanics, electricity and magnetism, thermal physics, waves and optics, and atomic and nuclear physics are among the topics covered, including a laboratory component. Completion of the course allows the student to take the Advanced Placement Physics B exam.

A.P. ENVIRO. SCIENCE Advanced Placement Course # 3605
Prerequisite: Biology (May be taken simultaneously) & teacher recommendation
The goal of the Advanced/AP Environmental Science is to provide students with the scientific principles, concepts, and methodologies required to understand the interrelationships of the natural world, and to identify and analyze environmental problems both natural and human made, to evaluate the relative risks associated with these problems, and to examine alternative solutions for resolving and/or preventing them.

A.P. BIOLOGY Advanced Placement Course # 3255
Prerequisite: Biology & teacher recommendation.
AP biology is an advanced course that explores basic biology concepts in greater depth. Designed to cover the required course work prescribed by the College Board, this course is fast paced and requires students to be independent learners. Topics include cell biology, molecular genetics, organismal biology and behavior, evolution, ecology, and structure and function of plants. Related laboratory exercises are an integral component and are integrated throughout the course work. Students enrolling in AP Biology must have completed a year of introductory biology during an academic year.

ROBOTICS AND ENGINEERING I (major)	**College Prep**	**Course # 6313**
ROBOTICS AND ENGINEERING I (minor)	**College Prep**	**Course # 6303**
ROBOTICS AND ENGINEERING I (major)	**Honors**	**Course # 6314**
ROBOTICS AND ENGINEERING II	**College Prep**	**Course # 6323**
ROBOTICS AND ENGINEERING II	**Honors**	**Course # 6324**
ROBOTICS AND ENGINEERING III	**Honors**	**Course # 6334**

Prerequisite: Robotics and Engineering I for Robotics II
Note: *Major meets one year of science requirement.
Course Descriptions for Robotics are on page 56 in Technology Education Courses.

Computer Science Courses

Course Title	Level	Course Number	Grade Level	Semester	# of Periods	Credits
Introduction to Computer Science	College Prep	2623	9-12	All	2	2.5
Introduction to Computer Programming	College Prep	2613	9-12	All	2	2.5
Programming in C (Prt. 1)	College Prep	2703	9-12	All	2	2.5
Programming in C (Prt. 1)	College Prep	2704	9-12	All	2	2.5
Programming in C (Prt. 2)	College Prep	2804	9-12	All	2	2.5
UNIX Operating System	College Prep	2603	9-12	All	2	2.5
Shell Programming	College Prep	2714	9-12	All	2	2.5
Assembly Language Programming	College Prep	2815	9-12	All	2	2.5
Data Structures	College Prep	2805	9-12	All	2	2.5
Graphics Programming	College Prep	2915	9-12	All	2	2.5
JAVA Programming	College Prep	2905	9-12	All	2	2.5
HTML Programming	College Prep	2713	9-12	All	2	2.5

INTRODUCTION TO COMPUTER SCIENCE **College Prep** **Course # 2623**

Prerequisites: None

This course is an introduction to computer science for students with no prior programming experience. Students develop programs using visual programming languages such as Scratch, to create animated simulations, design games, and build internet and mobile applications. In addition, students are exposed to an overview of computing and its influence on modern society.

INTRODUCTION TO PROGRAMMING **College Prep** **Course # 2613**

Prerequisites: None

This course is a general introduction to programming for the student with no computer experience. The course covers basic syntax for terminal I/O, conditionals, and loops using C. Students learn to write, compile, debug, and run C programs in a Windows PC environment. The course also introduces binary, octal and hexadecimal number systems.

PROGRAMMING IN C: Part 1 **College Prep** **Course # 2703**

Prerequisites: Introduction to Computer Programming

This course covers the concepts/syntax (in C) for arrays, structures, functions, arrays of structures, and pointers. Students will solve basic programming problems using these constructs. The course also introduces binary and hexadecimal arithmetic.

PROGRAMMING IN C: Part 1 **College Prep** **Course # 2704**

Prerequisites: Teacher recommendation or Introduction to Computer Programming

This course covers the concepts/syntax (in C) for arrays, structures, functions, arrays of structures, and pointers. Students will begin to solve more complex programming problems. Arithmetic in number systems other than base 10 will be introduced.

PROGRAMMING IN C: Part 2 **College Prep** **Course # 2804**

Prerequisite: Programming in C, Part 1, Level 3 or Level 4 and teacher recommendation

This course covers supplementary topics including (but not limited to) file I/O, command line parsing, macros, arrays of pointers, linked lists, and other data structures. Study of arithmetic in other bases will continue.

UNIX OPERATING SYSTEM **College Prep** **Course # 2603**

Prerequisites: None

This course familiarizes the student with the UNIX operating system and also covers some basic UNIX shell programming. No prerequisite is required but the student who is already familiar with a multi-user platform such as VAX/VMS will have considerably less difficulty mastering UNIX.

SHELL PROGRAMMING **College Prep** **Course # 2714**

Prerequisites: Introduction to the UNIX Operating System, Level 3 or Level 4 and Teacher Recommendation

This course covers UNIX shell programming using the bourne shell and k-shell. The student will learn to write programs using the UNIX bourne shell and k-shell programming constructs.

ASSEMBLY LANGUAGE PROGRAMMING **College Prep** **Course # 2815**

Prerequisite: Programming in C, Part 2 and Teacher Recommendation

Students learn to write programs in PC assembly language for 80386 and later processors. Students learn about machine language, binary logic, computer architecture, instruction cycles, etc. This course will prepare a student to become a Computer Science major in college.

DATA STRUCTURES **College Prep** **Course # 2805**

Prerequisite: Programming in C, Part 2 and Introduction to the UNIX Operating System and Teacher Recommendation

This course covers advanced topics in algorithms and data manipulation. Successful completion of this course will prepare the student for the Computer Science AP exam

GRAPHICS PROGRAMMING **College Prep** **Course # 2915**

Prerequisite: Programming in C, Part 2 and Introduction to the UNIX Operating System, and Teacher Recommendation

This course uses the OpenGL "Red Book" to cover the basics of graphics programming from simple pixel plotting to basic animation. Use of color, lighting, and textures are some of the topics covered.

JAVA **College Prep** **Course # 2905**

Prerequisite: Teacher Recommendation

This course is for the student has mastered the C programming language. The course moves quickly through the basics of JAVA, including pointers, arrays and structures. About half of the course is spent mastering the concept and implementation of JAVA classes. After completing this course the student will be prepared to take the Computer Science AP exam.

HTML PROGRAMMING **College Prep** **Course # 2713**

Prerequisite: none This is an introductory course with no prerequisites, but students who wish to take this course should be familiar with the operation of a PC. Students will learn to write HTML programs (construct web pages) on their own and with the help of software tools. Students who excel will be able to work with scripts and scripting languages by the end of the course.