

## Science Curriculum

### Anatomy and Physiology/Advanced Biology

Anatomy and Physiology/ Advanced Biology is designed primarily for students intending to pursue a career in the health and science industry in general, though it is open to any interested student. Anatomy and Physiology/Advance Biology is a course that will focus on basic principles of human body structure, functions, and foundations of pathology. Students will also learn and master practical laboratory skills that can prove to be useful for future employment with clinical and research institutions. Successful completion of General Biology and completion or parallel enrollment in Chemistry are required for taking Anatomy and Physiology I. In Anatomy and Physiology I the major focus is on correlation of form and function, beginning at the molecular level and eventually leading to the level of selected organ systems such as: integumentary, skeletal, muscular, and nervous. Normal physiology of the listed systems is studied with pathological highlights. The course also includes the comprehensive study of normal histology. Anatomy and Physiology I includes a required laboratory component. In the laboratory setting, students will examine basic principles of physiology; master macro- and microscopic techniques of tissue identification; examine the skeletal system and joints; perform dissections on assorted species in order to compare and contrast superficial and deep musculature, and structures of the eye and brain with that of human anatomy.

### Biology

Biology is a full year study of the basic concepts of the living world. The core principles of science are used to promote deep understanding and appreciation of complexity, diversity, and interconnectedness of life on Earth. The course focuses on: correlation between structure and function starting at the molecular level and up to the level of organisms; principles of genetics and evolutionary theory; energy transformations within living systems; and interactions between organisms and their environment. The emphasis is placed on the modern biotechnical and technical advances as applicable to medicine, food production, and human wellness. Students will be able to apply knowledge gained in this course to their everyday lives, make informed choices as members of the community, as well as to further their career in medicine, food services, cosmetology, and other related vocational areas. This course is supplemented with a required laboratory component corresponding to the material studied in the classroom. Students will gain skills using laboratory apparatuses and correct laboratory techniques and procedures. They will learn uses of classical and contemporary equipment in biological laboratories. Students will design and carry out investigations using the principles of the scientific method and learn proper formats for reporting their findings along with completing a required number of dissections.

## **Chemistry**

Chemistry is a full year course designed to enhance the students' science literacy as well as prepare them for college. By studying chemistry, the students will be able to understand the nature of materials in this world and the changes they undergo. Investigative and problem solving skills will be developed in order to better ready students for college and careers. The inquisitive world of science should grow interest and curiosity in the minds of students as they study more than just the basics of chemistry. Chemistry investigates matter and energy and the ways in which these two quantities interact. This course covers the basic concepts of chemistry including describing the common states of matter, making chemical solutions, atomic structure, and organization of the periodic table. A more in-depth look will be given to the characteristics of chemical compounds, including acids and bases, according to how chemical bonds are formed and nomenclature. Types and driving forces of chemical reactions will be investigated, as well as oxidation-reduction and neutralization reactions. Computational skills are developed in order to learn how to approach and solve chemical formula problems and stoichiometric calculations. Furthermore, students will develop and explain models and theoretical frameworks that have evolved over time. All of these topics will be in terms of real-life applications of chemistry concepts. A hands-on lab-based inquiry experience will complement each major area of study with the correct and safe use of laboratory equipment. This aspect of the course is designed so that students engage in scientific and engineering practices and apply crosscutting concepts to deepen their understanding of core ideas. In addition to designing and observing experiments, a group process of reflection and discussion will provide a platform for further theoretical investigations and an appreciation for the greater research being done today.

## **Physics**

Physics deals with the principles upon which the advances in modern technology are based. The major fields of mechanics, sound, and light are covered. As the year progresses, students will discover how unrelated phenomena can be explained with the help of a few fundamental unifying laws, and how a huge body of unrelated information can become unified. For example, out of the many motions of various bodies from the smallest nuclear particle to the giant planets the student will discover a few simple laws that describe all motion. Students will also gain an understanding of Newton's Universal Law of gravitation and Einstein's theory of gravity. An emphasis will be given to physics applications and related careers.

## **Biochemistry**

### **Objectives**

- Distinguish between organic and inorganic compounds.
- Recognize organic functional groups: alkanes, alkenes, alkynes, alcohols, esters, ethers, carboxylic acids, aromatics, cyclics, amines, etc.
- Cover in depth the 4 main classes of organic compounds essential to the life processes of all living things: carbohydrates, lipids, proteins, and nucleic acids.
  - Carbohydrates: monosaccharides, disaccharides, polysaccharides
  - Proteins: amino acids, dipeptides, polypeptides, enzymes
  - Lipids: fatty acids, triglycerides, phospholipids
  - Nucleic acids: DNA – structure, replication, protein synthesis  
RNA - structure, function  
Transcription; genetic codes, translation, human genomes.
- Understand biochemical reactions: substitution, addition, elimination, esterification, saponification, addition polymerization, condensation polymerization.
- Recognize biochemistry role in technology and society: examples – insulin: treating and preventing diabetes; skin cancer; DNA repair; DNA research; genetic engineering.

### **Basic Organic Chemistry**

Basic Organic Chemistry is a year-long unit of study beginning with a review of key chemical concepts from chemistry class.

- Nomenclature of alkanes, halogen compounds, unsaturated hydrocarbons, alcohols, esters, aldehydes, ketones, aromatics, carboxylic acids and amines.
- Reactions summary flow diagrams for all structures and the reactions and preparation of these structures are taught.
- Special applied organic chemistry is involved in the applications with discussions on pesticides, pheromones, blood alcohol content, as well as carcinogenic compounds.

This course ties in to the Biochemistry course which will delve into the details of the carbohydrates, amino acids, proteins, lipids, and nucleic acids.

## **Social Studies Curriculum**

### **American Government Civics**

American Government is a course that aims to increase the students' knowledge of the most essential political, economic, social and historical aspects of this nation's government. Through the lens of the U.S. Constitution, students will study how the ideals of American democracy – liberty, equality, and self-government – have guided the nation for over 200 years. Our nation's Founders struggled with how best to prevent government abuse of power. Their answer was to establish a constitutional government that protected individual rights by placing limits on what government can do and how it can exercise power. Therefore, instruction and assessment is based upon student understanding of the essentials of United States Government, beginning with a review of the fundamental principles of the United States Constitution.

### **U.S. History I/ U.S. History II**

This course will cover United States history from its pre-colonial period beginning in c. 1492 to the present. It covers all major aspects of American history during that period including: political, diplomatic, intellectual, cultural, economic and social. In addition, the course deals extensively with learning how to read, understand, analyze and interpret a wide variety of both primary and secondary texts together with the maps, graphs and pictorial materials associated with them. The course also aims to help students to put the knowledge and understanding they are gaining into practice through sharpening their oral and written communication skills. This will be achieved in two ways: First, through regular class discussions and occasional assigned oral presentations or debates. Second, through the regular writing of focused essays that requires both knowledge and analytical and interpretive skills. Though challenging, this course is extremely important in understanding the United States of America as it exists in the world today. Students will be rewarded in a myriad of ways for the effort they put into it. Finally, if the past is any guide to the present – and I believe that you will learn that it is – this course will be one of the most enjoyable and beneficial that you will ever take in your high school career.

### **World History**

World History is a full-year thematic course that aligns with the New Jersey Core Curriculum Content Standards. This course is a comprehensive study of World History and human interaction from The Emergence of the First Global Age to the 21st Century. Students will analyze world history, geography,

and cultures through in-depth analysis of the evolution of our modern world and its political and economic framework. Students are expected to read related literacy selections, evaluate primary resources, and engage in critical analyses and cultural comparisons. Research and writing skills are emphasized with an interdisciplinary approach. The digital age has transformed social studies education, allowing 21st-century learners to transcend the limits of time and place and experience historic events virtually. By expanding their learning networks through online collaboration with experts and other students from around the world, New Jersey social studies students develop an increased depth of understanding of our global society. At the same time, their understanding of the fundamental principles and values of American democracy and citizenship provides the conceptual framework that allows them to make informed decisions about local, national, and international issues and challenges. Social studies education provides learners with the knowledge, skills, and perspectives needed to become active, informed citizens and contributing members of local, state, national, and global communities in the digital age.

## World Language

### Spanish I

In Spanish 1 students will be introduced to common vocabulary, phrases and concepts necessary for daily interpersonal interaction. Emphasis will be placed on basic communication and comprehension in everyday situations, i.e. survival skills. Students will gain a working knowledge of the basic structure of the target language using the present tense. Students will engage in activities such as, the creation and performance of original dialogues, question and answer situations as posed by the teacher or other students, and various pair and group projects all centered in thematic units. Students will begin to talk about topics and situations that are of interest to them, their friends and the target language community. They will begin to speak Spanish and will discover how they can greet others in Spanish and talk to them about the daily routines of student life. Gradually, they will develop their ability to understand spoken and written Spanish.

### Spanish II

Spanish II is designed for students who have completed one year of Basic Spanish I or who have passed a placement test with a sufficient score. Second year students will learn to use different verb tenses (present and past tenses), continue to build vocabulary, and become more proficient in speaking and comprehension skills.

### Spanish III

Spanish III is designed for students who have completed Spanish I and II. It starts with a strong language program in the beginning levels. Students in the upper levels of study are most successful when earlier levels have featured thematic instruction with integrated vocabulary, grammar, communication and culture. The third year will provide further development in the areas of speaking, listening and writing. It also builds bridges to cultural understanding through readings on cultural products practices and comparisons.

### Italian

This course introduces the fundamental elements of the Italian language within a cultural context. Emphasis is on the development of basic listening, speaking, reading, and writing skills. Upon completion, students should be able to comprehend and respond with grammatical accuracy to spoken and written Italian as well as demonstrate cultural awareness.

## **French**

In French I, students will be introduced to the basics of the French language. Students will learn basic vocabulary, common expressions, and the fundamentals of grammar and pronunciation in order that they can converse on a variety of subjects, such as, family, school, and leisure activities. Students will read simple texts in French, write short paragraphs about familiar topics, and develop their ability to understand spoken French . French I will also introduce students to the various countries, customs, and traditions which comprise the Francophone world.

## **Mandarin**

An introductory course that provides students with a basic understanding of Chinese pronunciation, grammar and knowledge of some Chinese characters and basic vocabulary. Through interactive classroom work, laboratory exercises, and diverse oral and written assignments students will gain a beginning appreciation of Mandarin Chinese and Chinese culture.

## **Arabic**

An introduction to basic standard classical modern Arabic as used all over the Arab world in books, mass media, official records, and documents, etc. The course pays special attention to pronunciation, calligraphy, sentence structure, and vocabulary. It aims at developing the student's ability to hear, comprehend, read, write, and speak Arabic. Basic grammar is introduced all along the course.

## Mathematics

### Pre-Algebra

Pre-Algebra is an advanced course for seventh graders. This year-long course prepares students to enter the study of Algebra I (a high school credited course) as eighth graders. The focus of the course is building the foundation necessary for success in the study of algebra. Students will become familiar with the following: the properties of mathematics; the language of algebra; solving one step and two step equations; adding, subtracting, multiplying and dividing rational numbers and integers; solving inequalities; graphing equations and inequalities; proportion; percent; statistics and graphs; probability; applying algebra to geometry; measurement; introduction to trigonometry; and the study of polynomials.

### Algebra 1

Many of the concepts presented in Algebra I are progressions of the concepts that were started in grades 6 through 8. The content presented in this course is intended to extend and deepen the previous understandings. This course is offered to ninth graders who require additional preparation in Algebra in order to complete their High School diploma requirements. It is designed to give students the basic structures of Algebra using mathematical vocabulary, notation and structure to represent ideas, descriptions of relationships, and models of real life situations. Students will learn and practice applying algebraic concepts and skills through multiple representations. Course topics will include the study of functions, linear equations and inequalities, exponential functions, properties of exponents, polynomials, number sets and radicals, quadratic functions, rates, ratios and proportions, statistics, and regression modeling. Graphing calculators and real life applications are used throughout the course. Unit 1 begins with setting the stage for work with expressions and equations through understanding quantities and the relationships between them. The work in Unit 2 will build on the grade 8 concepts for linear and exponential relationships. Success in Unit 2 will lay the groundwork for later units where students will extend this knowledge to quadratic and exponential functions. The standards included in Unit 3 blend the conceptual understandings of expressions and equations with procedural fluency and problem solving. Students will not encounter solutions of quadratic equations that are complex. The standards presented in Unit 4 involve constructing, interpreting, and analyzing functions. Then, students enhance their understanding of descriptive statistics as well as summarize, represent and interpret data. To summarize, the critical areas in Algebra I include mastery of linear equations and inequalities, formalization and extension of function concepts (including function notation, domain and range, and exploration of many types of functions, including sequences), linear regression models, quadratic and exponential expressions, and quadratic functions.



## **Algebra 2**

Building on the understanding of linear, quadratic and exponential functions from Algebra I, this course will extend function concepts to include polynomial, rational, and radical functions. The standards in this course continue the work of modeling situations and solving equations.

## **Geometry**

Moving towards formal mathematical arguments, the standards presented in this high school geometry course are meant to formalize and extend middle grades geometric experiences. Transformations are presented early in the year to assist with the building of conceptual understandings of the geometric concepts.

In unit 1, triangle congruence conditions are established using analysis of rigid motion and formal constructions. Various formats will be used to prove theorems about angles, lines, triangles and other polygons. The work in unit 2 will build on the students understanding of dilations and proportional reasoning to develop a formal understanding of similarity.

The standards included in unit 3 extend the notion of similarity to right triangles and the understanding of right triangle trigonometry. In developing the Laws of Sines and Cosines, the students are expected to find missing measures of triangles in general, not just right triangles.

Work in unit 4 will focus on circles and using the rectangular coordinate system to verify geometric properties and to solve geometric problems. Concepts of similarity will be used to establish the relationship among segments on chords, secants and tangents as well as to prove basic theorems about circles.

The standards in unit 5 will extend previous understandings of two- dimensional objects in order to explain, visualize, and apply geometric concepts to three-dimensional objects. Informal explanations of circumference, area and volume formulas will be analyzed.

## **Pre-Calculus**

Pre-Calculus is a course with college-level algebra and trigonometry that is designed to prepare students for the study of calculus. This course involves covering algebraic topics that might not have been given attention in earlier algebra courses. In this course the student will study functions, their common properties, individual attributes and their applications.

- In Unit 1, students study functions and their properties. Topics of study include parent functions, combinations of functions, inverses of functions, and transformations. Students will also extend their understanding of polynomial functions, rational functions, exponential functions, and logarithmic functions from Algebra 2.
- In Unit 2, trigonometric functions are applied to real world situations. Connections are made to the unit circle and students will analyze trigonometric functions.
- In Unit 3, students simplify trigonometric expressions, prove identities using trigonometric functions, and solve trigonometric equations. Students will also use the Law of Sines and the Law of Cosines to solve real world problems. Application of vectors to real world situations will also be covered.
- In Unit 4, students will study parametric functions and polar coordinates. Limits will also be introduced to give the students a preview into calculus.

## **AP Calculus**

AP Calculus has two levels, Calculus AB and Calculus BC. The course teaches all topics associated with Functions, Graphs, Limits, Derivatives, Integrals, Polynomial Approximations, Series, Parametric and Polar Equations. By the end of the course students will have learned how to work with functions represented in a variety of ways – graphically, numerically, analytically and verbally. These techniques support each other and add to a clearer understanding of calculus. The numerical and graphical procedures they learn can be apply with any kind of function they have encountered in their previous courses. The course teaches students how to use graphing calculators to help solve problems, experiment, interpret results, and support conclusions. The course also teaches students how to communicate with mathematics and explain solutions to problems both verbally and in written sentences. Calculus is a transition course linking the mathematical and algebraic procedures taught in previous classes with the higher-level skills required in post-secondary technical programs.

## **Electives**

### **Drama**

Drama is a year course which places an emphasis on play reading and the acting out of plays. This course will include a large practical component including making and performing drama. There will also be a written component, including appreciating of drama which will look at drama history and reflection.