SCIENCE

To graduate from high school, students are required to have one year of physical science and one year of life science. Students whose plans include college are strongly encouraged to take courses in biology, chemistry, and physics. Students who have an interest in scientific careers such as mathematics, engineering, medicine, and the sciences often elect to take the honors, accelerated, and advanced placement courses. All biology, chemistry, physics and biotechnology courses fulfill the University of California laboratory science requirement. Chemistry 1 and Physics 1 are less mathematical in nature. Astronomy and Environmental science courses meet the California State University science requirements but not UC laboratory science requirement.

3108 Biology 1 9
3115 Biology 1A 9
3109 Biology 1AC 9

In all three biology courses topics include cell biology, genetics, evolution, biodiversity, ecology, biochemistry, physiology and biotechnology. Topics will be developed through laboratory exercises, discussions, lectures, demonstrations, information research projects, and field trips. Scientific skills and methods are emphasized. Biology courses will vary in depth of coverage of each topic, degree of independent learning, and amount of homework required.

The following table shows predictors for success:

PREDICTORS FOR SUCCESS IN EACH BIOLOGY COURSE			
Predictor	**Biology 1**	**Biology 1A**	**Biology 1AC**
Commitment to hours of required homework per week	2 Hours	2-3 Hours	3-5 Hours
Prior grades in core subjects of math, sciences, social sciences, and English	Successful Completion	A's and B's	Mostly A's
Degree of independent learning and academic responsibility	Significant structure provided by the teacher.	Independence; moderate structure provided by the teacher.	High level of independence and organization required of the student.
Intended Preparation for future courses.	Biology 1 is a college preparatory biology course, is paced at grade level and prepares students for other grade level courses.	Biology 1A is an *advanced* college preparatory biology course and is paced at high grade level.	Biology 1AC is an *accelerated* college preparatory biology course and is paced above grade level. Any student who is highly likely to take advanced coursework (AP Sciences) is *strongly* encouraged to enroll in Biology 1AC their freshman year.

The following outcomes/ESLRs can be addressed through each Biology course:

- ESLRs: 1, 2, 3, 5, 6, 7
- Homework Estimate: Biology 1 is 2 hours per week
  Biology 1A is 2-3 hours per week
  Biology 1AC is 3-5 hours per week

SMALL LEARNING COMMUNITY

(No Section Number) Year 9

Our small learning community is designed for 28 freshmen and will provide a tightly knit community, integrated curriculum, outdoor adventure, and opportunities to grow as leaders.

All students will share some common classes and teachers. The content and standards will be the same as our traditional courses; however, in the small learning community program, the teachers and students will work together to explore common themes and demonstrate their knowledge in some cross-curricular projects.

Students in the Small Learning Community will be enrolled together in the same English, Biology 1A, history and PE courses which, in addition to the traditional content, will focus on leadership, character, and team building games.

Although not required, we encourage students in the Small Learning Community to enroll in Art Spectrum, Living Skills, and Spanish as their electives, as those teachers will incorporate our common themes into their courses.

In addition, we will offer our students outdoor adventure trips and leadership training as they do a day field trip to Jasper Ridge and a four day trip to Yosemite and take part in the Yosemite Institute.

Our theme is "A Sense of Place," and in our integrated curriculum, students will explore their place in history and in the local and global community. Our small learning community will provide ninth graders with a sense of place at Gunn, as they transition from the middle to the high school.

AP COLLEGE BIOLOGY

3139 COLBIOL AP Year 11-12

Prerequisite: All students must complete an application in order to enroll. Applicants who have satisfied the following prerequisites are guaranteed enrollment:

1. Bio 1 (A) or Bio 1A (B+) or Bio 1AC (B-) and
2. Chem 1 (B+) or Chem H (C)

Consent of the instructor is required for all applicants who have not met the prerequisites.

This course meets graduation, University of California and California State University laboratory science requirements.

AP College Biology is designed to provide a survey of biological knowledge at an introductory college level. Because successful completion of the curriculum will enable students to take the College Board Advanced Placement Examination, the course follows the outline recommended by the College Board, covering the general content areas of: (1) Molecular and Cellular Biology; (2) Genetics and Evolution; and (3) Organisms and Populations.

The course focuses on developing the ability to integrate content information from multiple units, utilizing several common themes: (1) relationships between structure and function; (2) acquisition, transformation and use of energy; and (3) adaptation leading to evolutionary fitness. Heavy emphasis is placed on understanding the connection between experimentation and scientific discovery. Both hands-on laboratory activities and scientific readings are used to show how biological information is gained, interpreted, and applied. Required homework includes extensive reading, regular written lab reports, occasional group projects, and a year-end independent research project.

The following outcomes/ESLRs can be addressed through this course:

- ESLRs: 1, 2, 3, 4, 5, 6, 7
- Homework Estimate: 5-8 hours per week

CHEMISTRY / ENVIRONMENTAL SCIENCE

All chemistry and environmental science courses meet the physical science graduation requirement and a California State University laboratory science requirement. Chemistry 1 and Chemistry 1H both meet University of California lab science requirements. Both Chemistry courses cover the same fundamental concepts but differ in the degree of analysis, quantitative understanding and independent thinking required of students. Environmental science offers a non-quantitative alternative for students who do not plan to enroll in advanced science classes in their junior and senior year. The following table shows predictors for success in these courses:

Predictor	Environmental Science	Chemistry 1	Chemistry H
Previous Mathematics courses	Alg 1 - P	Alg 1 – B Alg 1A – C+ Alg 1A/Gem - C	Alg 1A – Not Recommended GeomA – A- Alg 1A/GeomA – A- Alg2 - B Geom/Alg2A- B- Alg2/TrigH – B- Trig/Anlt - C
Previous Biology Course	Any Biology – P (Must Pass Biology to enroll.)	Bio 1 – B Bio 1A – C+ Bio 1AC - C	Bio 1 –Not Recommended Bio 1A – A Bio 1AC – B+
Degree of independent learning and academic responsibility	Requires structure and guidance	Limited Guidance Needed	Highly Self- Motivated
Commitment to hours of required homework per week	1-2 hours per week	2-3 hours per week	3-5 hours per week

INTRO TO ENVIRONMENTAL SCIENCE

3278 ENVIRO SCI Year 10-12

Prerequisite: Completion of Biology. Completion of Algebra 1.

This course meets graduation and California State University laboratory science requirements. It also satisfies University of California "G" elective requirement.

Environmental Science is an elective course that is open to students who have already successfully completed (passed) biology as well as Algebra 1 at a minimum. Students will learn science concepts while applying them to real issues. The first semester of the course will focus on a study of our environment including the atmosphere, the oceans, soil and soil dynamics and internal earth processes. The second semester will apply these concepts to global issues including land and water use, pollution, energy resources and global change. This is a hands-on course and much of the curriculum will be project based.

The following outcomes/ESLRs can be addressed through this course:

- ESLRs: 1, 2, 3, 4, 5, 6, 7
- Homework Estimate: 1-2 hours per week

CHEMISTRY 1

3610 CHEMIST 1 Year 10-12

Prerequisite: Completion of Biology 1 (B or better) Biology 1A (C+), Biology 1AC (C) or the equivalent. Completion of Algebra 1 (B or better), Algebra 1A (C+), Alg 1A/Geom A (C) or Geo/Alg 2 Adv. (pass). (Students who are earning an A or B in Alg 1A/Geom A or a B or better in Geo/Alg 2 Adv. May want to consider Chemistry 1H). Consent of department is required for exceptions.

This course meets graduation, University of California and California State University laboratory science requirements.

Chemistry 1 is intended for students who want to study the fundamental concepts of chemistry. Topics covered include atomic structure, chemical nomenclature, stoichiometry, gas laws, states of matter, bonding, periodic properties of elements, solutions chemistry, kinetics of reactions, chemical equilibrium, acid-base reactions, oxidation reduction reactions and nuclear chemistry. *(Note: same topics as Chem H)*.

The course includes many laboratory experiments and demonstrations. Students learn how to work safely in the laboratory, how to perform basic laboratory operations, how to organize and interpret data, how to draw conclusions from experimental results.

The following outcomes/ESLRs can be addressed through this course:
- ESLRs: 1, 2, 3, 4, 5, 6, 7
- Homework Estimate: 2-3 hours per week

CHEMISTRY 1H

3619 CHEMIST 1H Year 10-12

Prerequisite: Completion of Biology 1AC (grade A or B+) or Biology 1A (grade A). Completion of Algebra 1A (grade of A). Alg 1A/Geom A (grade of B+ or better) or Geo/Alg 2 Adv (Grade of B or better) or concurrent enrollment in Alg2/Pre-Calculus H or Trig/Anlt H.

This course meets graduation, University of California and California State University laboratory science requirements.

Chemistry 1H introduces students to the study of the structure, properties, and changes of matter. It emphasizes the development of chemical principles and theories on the basis of experimental data, and includes many laboratory experiments and demonstrations. The quantitative study of chemistry requires both strong analytical skills and the ability to apply concepts to laboratory results. Topics covered include: atomic structures, chemical nomenclature, stoichiometry, gas laws, states of matter, bonding, periodic properties of elements, solutions chemistry, kinetics of reactions, chemical equilibrium (with an emphasis on solubility), acid base reactions, oxidation-reduction and nuclear chemistry. As preparation for those students taking College Biology AP the course will conclude with an application of chemical principles to organic chemistry. Students carry out an independent project in the second semester.

The following outcomes/ESLRs can be addressed through this course:
- ESLRs: 1, 2, 3, 4, 5, 6, 7
- Homework Estimate: 5 hours per week

AP COLLEGE CHEMISTRY

3609 COLCHEM AP Year 11-12

Prerequisite: All students must complete an application in order to enroll. Applicants who have satisfied the following prerequisites are guaranteed enrollment:
1. Chemistry 1 (grade of A) OR Chemistry Honors (grade of B or better).
2. Algebra 2/Trig H (grade of B or better) OR Trig/Analy H (grade of B or better) OR Analysis H (grade of B or better) OR Pre-Calculus (grade of A).

This course meets graduation, University of California and California State University laboratory science requirements.

AP College Chemistry is a lab based class designed to provide a survey of chemistry at an introductory college level. Because successful completion of the curriculum will enable students to take the College Board Advanced Placement Examination, the course follows the outline recommended by the College Board, covering the general content areas of: structure of matter, states of matter, descriptive chemistry and chemical reactions. It includes an extensive lab component that is comparable to college

level chemistry course and requires additional lab time outside of class. AP College Chemistry differs from Chemistry Honors in the depth of coverage of each topic, the amount of time in the chemistry lab and the inclusion of enrichment topics in chemistry.

The following outcomes/ESLRs can be addressed through this course:
- ESLRs: 1, 2, 3, 4, 5, 6, 7
- Homework Estimate: 8 hours per week on average.

AP COLLEGE ENVIRONMENTAL SCIENCE

3279 AP ENVIRONMENTAL SCIENCE Year 11-12

Prerequisite: Biology (Bio 1 – A, Bio 1A – B-, Bio 1AC - C) AND Chemistry (Chem 1 – B+, Chem 1H – C)

AP Environmental Science is structured to provide a survey of earth's geology and history, its environmental processes, disturbances to these processes, impact of human population on the environment and governmental regulation of local and international environmental issues.
- The course follows the outline recommended by the College Board and is designed to enable students to successfully take the College Board Advanced Placement Examination.
- Students earn 10 units of high school science credit for passing this course. If a student's course grade and AP exam score meet the requirements of their college, they can earn up to 5 college semester units of credit.
- Topics covered in this course are outlined in the unit-by-unit plan enclosed below, and encompass every learning objective contained in the AP Environmental Science Course Description published by the College Board.
- Students also learn to integrate their knowledge across topics, utilizing themes such as: energy cycling within living ecosystems, effect of humans on natural systems, political and regulatory impacts on environmental policies, importance of sustainability, and interconnections/inter-relations between biomes around the globe.

The ***general course goals and topics*** are arranged roughly here by unit:
Unit 1: Overview of Mother Earth
Unit 2: Living Ecosystems in Balance
Unit 3: Population Dynamics
Unit 4: How Humans Use the Earth's Resources
Unit 5: Pollution
Unit 6: Global Disturbances
Unit 7: Human Energy Consumption
Unit 8: Independent Projects

In recognition that all students are expected to take the AP Environmental Science exam in May, course content, laboratory activities, textbook assignments, activities and projects will all be carried through with the skill and content required to be successful on the AP exam. It is expected that students who are earning a "C" grade or higher in the class will be able to achieve a "3" or higher on the AP exam. (5 Point Scale).

The curriculum of APES ***incorporates*** the *California State Science Standards* as well as the *Palo Alto Expected Student Learning Results*, and will serve as foundations for this course.

The following outcomes/ESLRs can be addressed through this course:
- ESLRs: 1, 2, 3, 4, 5, 6, 7
- Homework Estimate: 4-6 hours per week

PHYSICS

All physics courses meet the physical science graduation, University of California Lab Science and California State University laboratory science requirements. All physics courses cover mechanics and electromagnetism. With the exception of AP Physics (C), all courses also include optics and modern physics. Additional emphasis may be placed on thermodynamics, astronomy, and other physics-related or interdisciplinary topics at the discretion of the instructor. Within each topic basic concepts are developed and applications to daily life are explored.

CONCEPTUAL PHYSICS

3810 PHYSICS 1 Year 10-12

Prerequisite: Algebra 1 (B- or better) or Alg 1A (C or better), Algebra 1A/GeomA (C). Biology 1A (C+) Bio 1 (B-) or Bio 1AC (C or better).

This course meets graduation, University of California and California State University laboratory science requirements.

The goal of Physics 1 is to develop a conceptual understanding of the fundamental principles of physics. Students will explore these concepts in the laboratory and will apply them in problem solving situations and to explain physical phenomena in their daily lives. Included are all of the topics listed above with emphasis at a basic level on mathematical descriptions of physical phenomena. Students will apply their knowledge of geometry and first year introductory algebra.

The following outcomes/ESLRs can be addressed through this course:

- ESLRs: 1, 2, 4, 5, 6, 7
- Homework Estimate: 2-3 hours per week

PHYSICS 1A

3818 PHYSICS 1A Year 11-12

Prerequisite: Completion Bio 1 (A), Bio 1A (B) or Bio AC (C) AND one of the following math sequences: Alg 1A (A) and Geometry (A) and Algebra 2 (B) OR Alg 1A/GeomA (B) and Alg 2/Trig H (B) OR Trig/Anlt H (C)

This course meets graduation, University of California and California State University laboratory science requirements.

This course is designed for students who are planning to pursue a university degree and who are strong in mathematics. Traditional physics concepts are studied with an emphasis on developing concepts, building mathematical models to describe physical phenomena, and problem solving. Students in this course will use the skills they develop in second-year algebra, geometry, and trigonometry.

The following outcomes/ESLRs can be addressed through this course:

- ESLRs: 1, 2, 3, 4, 5, 6, 7
- Homework Estimate: 2-3 hours per week

AP COLLEGE PHYSICS (B)

3869 COLPHYSAPB Year 11-12

Prerequisite: All students must complete an application in order to enroll. Completion of Algebra 2/Pre-Calculus Honors, or IAC (B+ or A) or Trig Analt H (B). Concurrent enrollment in AB Calculus, Analysis Honors, or Pre-Calculus is strongly recommended, as is completion of a course in chemistry (with grade of A or strong B).

This course meets graduation, University of California and California State University laboratory science requirements.

This course is an introductory survey course in physics with an emphasis on laboratory work and problem solving. It is equivalent to a full year of an algebra/trig-based college physics sequence. The course is designed for students who are planning to pursue a university degree and who are strong in mathematics. Topics include: mechanics, thermodynamics, fluids, optics, nuclear physics, electricity and magnetism. This course prepares students to take the Advanced Placement Physics B exam in the spring.

The following outcomes/ESLRs can be addressed through this course:
- ESLRs: 1, 2, 3, 4, 5, 6, 7
- Homework Estimate: 4-6 hours per week

AP COLLEGE PHYSICS (C)

3879 COLPHYSAPC Year 11-12

Prerequisite: All students must complete an application in order to enroll. Completion of or concurrent enrollment in BC Calculus or completion of AB Calculus. A course in chemistry is strongly recommended. Prior experience with physics is suggested. Students should have A or strong B grades in prior math and science courses. Consent of department required for exceptions.

This course meets graduation, University of California and California State University laboratory science requirements.

AP Physics C is an advanced physics course equivalent to the course taken by physics majors and engineers at most universities, taught with calculus. It concentrates on Mechanics and Electricity and Magnetism, two semesters of the usual college curriculum. Students with particular strengths in math and science, and students with a serious intent to major in science or engineering should consider this course. The course prepares students to take the Advanced Placement examinations in Mechanics and/or Electricity and Magnetism.

The following outcomes/ESLRs can be addressed through this course:
- ESLRs: 1, 6, 7
- Homework Estimate: 4-6 hours per week

SCIENCE ELECTIVES

ASTRONOMY

3281 ASTRONOMY Year 11-12

Prerequisite: Biology 1 or higher (pass). Consent of department required for exceptions.

This course meets graduation and California State University laboratory science requirements. Also satisfies University of California "G" elective.

Astronomy is an elective course open to all students that parallels the first year astronomy course offered at the college level. Three major aspects of astronomy form the focus for the course. 1) the history and development of astronomical understanding including the discovery and applications of the physical laws that govern observed behavior in the cosmos; 2) the structure and evolution of astronomical systems, including the solar systems, stars, galaxies, and the universe as a whole; 3) the tools and techniques used to study the cosmos, including a study of telescopes, spectral analysis, and interpretation of observed phenomena. Current astronomical happenings and theories will be explored in multiple ways, including study of the sky with telescopes and naked eye observations, use of modern analysis techniques, applications of astronomical knowledge to space exploration and the search for extra-terrestrial life, and Internet research. Each semester of Astronomy may be taken independently.

The Following Outcomes/ESLRs can be Addressed through this Course:
- ESLRs: 1, 2, 3, 4, 5, 6, 7
- Homework Estimate: 1-2 hours per week

BIOTECHNOLOGY: THEORY & PRACTICES (ROP) / SCIENCE

3955 BIO TECH Year 11-12

Prerequisite: Successful completion of Biology; and Chemistry or permission of instructor. Strongly recommended: concurrent enrollment in Physics, Astronomy, or AP Biology or AP Chem.

This course satisfies University of California entrance "d" requirements for science; satisfies high school graduation requirement for Career Technical Education (CTE).

This course will introduce students to the theoretical aspects of Biotechnology (Cell Biology, Microbiology, Molecular Biology, Immunology) and societal issues arising from this new technology. Hands on laboratory activities will reinforce theoretical information and teach lab safety, data analysis, the scientific method, and related computer skills. This course will include topical speakers from biotechnology industry and research and field trips to visit nearby biotech industry sites and labs. *(See cross listing in Career Technical Education Department.)*

The following outcomes/ESLRs can be addressed through this course:

- ESLRs: 1, 2, 3, 4, 5, 6, 7
- Homework Estimate: 3 hours per week (extra 1 hour per week during project time)