HOMEWOOD FLOSSMOOR
HIGH SCHOOL
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EXCELLENCE
FLOSSMOOR ILLINOIS
1959

Science

Sean Byrne, Chair sbyrne@hfhighschool.org 335-5590

Homewood-Flossmoor High School

H-F Academic
School Year 2011-2012

Program Rationale

The science curriculum at H-F is designed to facilitate the transformation of all students into life-long problem solvers.

Program Goal Through experimentation, inquiry, critical thinking, and teamwork, all students are provided with the experiences necessary to become responsible decision-makers within our increasingly technological world.

Course Goals The individual courses offered in the study of science are designed so that all students are provided opportunities to

- Gather and analyze data in an effective, accurate and safe manner;
- Gain the knowledge base needed to be scientifically literate;
- Develop problem-solving and critical thinking skills;
- Develop work habits and skills needed to be a useful member of a problem-solving team.

Special points of interest:

- ZooBot Club
- Science Olympiad
- Advanced Placement: Biology, Chemistry, Physics B & C, Environmental Science

Program Learning Objectives *by Core Courses*

Biology

Students will…

- Know and apply concepts that explain how living things function, adapt and change.
- Describe the structures and organization of cells and tissues that underlie basic life functions including nutrition, respiration, cellular transport, biosynthesis and reproduction.
- Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms.
- Explain changes within cells and organisms in response to stimuli and changing environmental conditions (e.g., homeostasis, dormancy).
- Know and apply concepts that describe how living things interact with each other and with their environment.

Chemistry

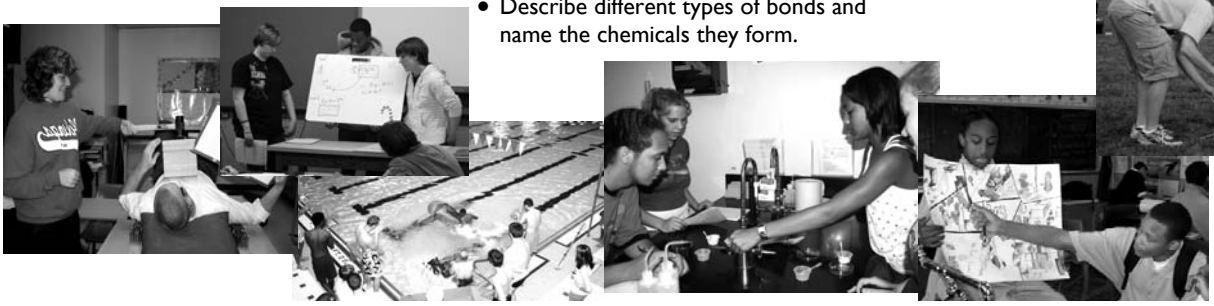
Students will…

- Know and apply concepts that describe properties of matter and energy and the interactions between them.
- Explain interactions of energy with matter including changes of state and con-servation of mass and energy.
- Use kinetic theory, wave theory, quantum theory and the laws of thermodynamics to explain energy transformations.
- Analyze solutions and reactions in natural and man-made energy systems.
- Model and describe the chemical and physical characteristics of matter (e.g., atoms, molecules, elements, compounds, mixtures).
- Analyze and explain the atomic structure of matter.
- Analyze the properties of materials.
- Describe different types of bonds and name the chemicals they form.

Physics

Students will…

- Know and apply concepts that describe force and motion and the principles that explain them.
- Explain and demonstrate how forces affect motion (e.g., action/reaction, equilibrium conditions, free-falling objects).
- Explain and predict motions in inertial and accelerated frames of reference.
- Analyze factors that influence the relative motion of an object (e.g., friction, wind shear, cross currents, potential differences).
- Explain the factors that affect the gravitational forces on objects (e.g., changes in mass, distance).
- Describe the effects of electromagnetic forces and wave interaction.



Science
Course Sequence

Required Courses
The following courses, listed in sequence, are required for graduation.

Biology
Honors (4122)
College Prep (4012)

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Chemistry
Honors (4232)
College Prep (4220)

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Physics
AP Physics B (4524/2425)
Honors (4332)
College Prep (4322)
Principles (4320)

Electives
The following courses may be taken as electives, earning credit towards graduation. In many cases, students must meet prerequisites in order to qualify for elective courses.

AP Biology
Honors (4501/4502)

AP Chemistry
Honors (4511/4512)

AP Physics B
Honors (4525/4524)

AP Physics C
Honors (4526/4522)

AP Environmental Science
Honors (4531/4532)

Engineering Physics
Honors (4363)

Forensic Science
Honors (4701)

Geology & Astronomy
Honors (4312)

Microbiology
Honors (4172)

Physical Science
Academic Core (4032)

Zoology & Botany
CP (4183) or H (4187)

Science

Code	Title-Level	Year	Credit	Prerequisite	Grade
4012	*Biology – AC*	*1*	*1*	*No*	*9*
4032	*Physical Science – AC*	*1*	*1*	*Yes*	*10*
4122	*Biology – CP*	*1*	*1*	*No*	*9*
4152	*Biology – H*	*1*	*1*	*No*	*9*
4172	*Microbiology – H*	*1*	*1*	*Yes*	*11-12*
4187	*Zoology and Botany (ZooBot) - H*	*1*	*1*	*Yes*	*12*
4183	*Zoology & Botany (Zoobot) - CP*	*1*	*1*	*Yes*	*12*
4220	*Chemistry – AC*	*1*	*1*	*Yes*	*10*
4222	*Chemistry – CP*	*1*	*1*	*Yes*	*9-10*
4232	*Chemistry – H*	*1*	*1*	*Yes*	*9-10*
4312	*Geology and Astronomy – H*	*1*	*1*	*Yes*	*11-12*
4320	*Principles of Physics – CP*	*1*	*1*	*Yes*	*11*
4322	*Physics – CP*	*1*	*1*	*Yes*	*10-12*
4332	*Physics – H*	*1*	*1*	*Yes*	*10-12*
4363	*Engineering Physics – H*	*1*	*1*	*Yes*	*11-12*
4501/4502	*Advanced Placement Biology – H*	*1*	*1*	*Yes*	*10-12*
4511/4512	*Advanced Placement Chemistry – H*	*1*	*1*	*Yes*	*10-12*
4524/4525	*Advanced Placement Physics B – H*	*1*	*1*	*Yes*	*10-12*
4522/4526	*Advanced Placement Physics C – H*	*1*	*1*	*Yes*	*10-12*
4532	*Advanced Placement Environmental Science – H*	*1*	*1*	*Yes*	*11-12*
4701	*Forensic Science – H*	*1*	*1*	*Yes*	*11-12*

Sean F. Byrne
Department Chair
Ext. 5590

Department Goals:

1. To be appropriately prepared for standardized tests such as the ACT, SAT, and PSAE, students should complete Biology, Chemistry and Physics with a minimum grade of "C" in each semester.
2. Students are required to take 3 units of science in order to fulfill graduation requirements. This must be met by earning credit in Biology, Chemistry, and Physics.
3. Students **must meet** both semesters of math and science prerequisites to ensure that students have the appropriate background for a course. In some cases, prerequisites can be met with department chair consent.

Biology **4012**
Level: Academic Core
Prerequisite: None
Open To: Freshmen
Length: Year
Credit: 1

Academic Core Biology offers an active learning approach to discovering biological themes. Topics investigated will include cell structure, cellular processes, DNA, genetics, biotechnology, evolution, animal systems, and ecology. Instructional methods include laboratory investigations, lectures, group activities, computer simulations, the Internet, and textbook readings. Student evaluation is based on unit examinations, quizzes, daily work, lab reports, and individual and group projects. Academic Core Biology is designed to motivate students to take an active role in their learning. Students who register for this class will be integrated into 4122 Biology CP.

Biology **4122**
Level: College Prep
Prerequisite: None
Open To: Freshman
Length: Year
Credit: 1

College Prep Biology offers an active learning approach to discovering biological themes. Topics investigated will include cell structure, cellular processes, DNA, genetics, biotechnology, evolution, animal systems, ecology, and photosynthesis. Instructional methods include textbook readings, lectures, laboratory investigations, computer simulations, individual and group projects. Student evaluation is based on unit examinations, quizzes, daily work, lab reports, and individual and group projects. College Prep Biology is designed to motivate students to take an active role in their learning.

Biology **4152**
Level: Honors
Prerequisite: None
Open To: Freshmen
Length: Year
Credit: 1

Honors Biology offers an active learning approach to discovering biological themes. Topics investigated will include cell structure, cellular processes, DNA, genetics, biotechnology, evolution, animal systems, and ecology. Instructional methods include textbook readings, lectures, inquiry-based laboratory investigations, computer simulations, individual and group projects. Student evaluation is based on unit examinations, daily work, lab reports and projects. Students are expected to do a significant amount of independent reading each night. The rigor and requirements of this course are significantly higher than at other levels. Honors Biology is designed for the self-motivated student.

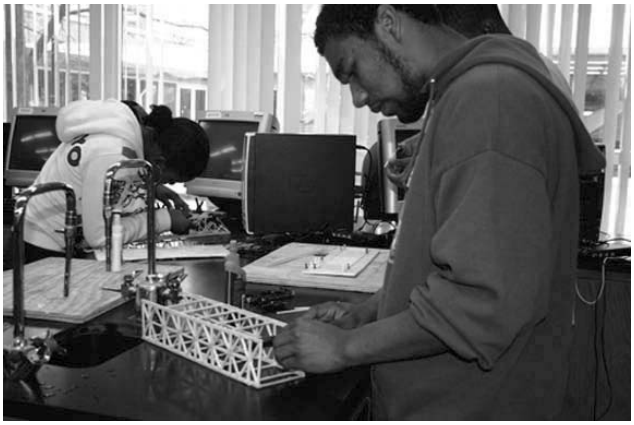
Science

Physical Science	**4032**	Physical Science is a laboratory - based class taught with a "hands-on" approach. In this course, labs are done on a daily basis and students are expected to participate daily. During the first semester, the focus is chemistry; during second semester, the class focus is physics. *May be required for some students.*
Level:	Academic Core	
Prerequisite:	Biology & Pre-Algebra	
Open To:	Sophomore	
Length:	Year	
Credit:	1	

Chemistry	**4220**	Chemistry is an inquiry-based course. Since mathematics is an integral part of the course, students should be able to solve first-degree equations and be able to construct and interpret graphs. Topics developed include measurement, the nature and characteristics of matter, atomic structure, the Periodic Table, chemical bonding, nomenclature, chemical reactions, chemical quantities and stoichiometry, states of matter and thermodynamics, gas laws, acid/base chemistry, and organic chemistry. Instructional methods include direct instruction, readings from the textbook and other sources, laboratory demonstrations and investigations, individual and group activities, discussion, and computer-assisted activities. Student evaluation is based on tests, quizzes, lab reports, class work, homework, and other special projects. Students registering for this course will be integrated into 4222.
Level:	Academic Core	
Prerequisite:	Algebra 1	
Open To:	Sophomore	
Length:	Year	
Credit:	1	

Chemistry	**4222**	Chemistry is an inquiry-based course. Since mathematics is an integral part of the course, students should be able to solve first-degree equations and be able to construct and interpret graphs. Topics developed include measurement, the nature and characteristics of matter, atomic structure, the Periodic Table, chemical bonding, nomenclature, chemical reactions, chemical quantities and stoichiometry, states of matter and thermodynamics, gas laws, acid/base chemistry, and organic chemistry. Instructional methods include lectures, readings from the textbook and other sources, laboratory demonstrations and investigations, individual and group activities, discussion, and computer-assisted activities. Student evaluation is based on tests, quizzes, lab reports, class work, homework, and other special projects.
Level:	College Prep	
Prerequisite:	Algebra 1	
Open To:	Fr, Soph.	
Length:	Year	
Credit:	1	

Chemistry	**4232**	Honors Chemistry is recommended for students with an interest in careers such as science, engineering, or medicine. Students will investigate concepts in greater depth and at a faster pace than the students in the CP level. Students must have more advanced mathematical skills to be successful. Topics include energy changes, atomic structure, the Periodic Table, stoichiometry, chemical bonding, equilibrium, acids and bases, gas laws, and thermodynamics. Instructional strategies include lectures, demonstrations, laboratory work, readings, and computer work. Student evaluation is based on tests, quizzes, laboratory reports, class work, homework, and projects. The rigor of this course is significantly higher than in other levels.
Level:	Honors	
Prerequisite:	C or better in Alg 1H or A in Alg 1CP	
Open To:	Fr, Soph.	
Length:	Year	
Credit:	1	



Principles of Physics **4320**

Level:	College Prep
Prerequisite:	Physical Science & Chemistry
Open To:	Seniors
Length:	Year
Credit:	1

This course is designed to provide students with the skills necessary to become life-long problem solvers, as well as succeed in further science courses. This will be accomplished through the study of the classical physics concepts of motion, energy, momentum, waves, light, electricity, magnetism, sound. The concepts will be presented using a variety of techniques including: class discussion, lecture, problem-solving activities, laboratory experiments, research projects, and audio-visual presentations. The emphasis on this course is on using physics concepts for problem solving – both mathematical and real-world problems. *May be required for some students*.

Physics **4322**

Level:	College Prep
Prerequisite:	Algebra CP
Open To:	Soph, Jr., Seniors
Length:	Year
Credit:	1

Physics is designed to provide students with the skills necessary to become life-long problem solvers as well as succeed in further science courses at the collegiate level. This will be accomplished through the study of the classical physics concepts of motion, energy, momentum, waves, light, electricity, magnetism, and modern physics. The principles and concepts are studied using graphical, algebraic, geometric, and trigonometric methods of analysis as well as laboratory experiments and demonstrations. Information will be presented using a variety of techniques including: class discussion, lecture, problem-solving activities, laboratory experiments, research projects, and audio-visual presentations. The emphasis on this course is on using Physics concepts for problem solving – both mathematical and real world problems.

Physics **4332**

Level:	Honors
Prerequisite:	Credit or Concurrent Enrollment in 3321 Alg 2/Trig H or 3241 Pre-Calculus CP
Open To:	Soph, Jr., Seniors
Length:	Year
Credit:	1

This course is designed for the extremely self-motivated student that is looking for a challenging science course, and who will pursue further study of Physics, other sciences, medicine, or engineering. The student in this class has a complete grasp of algebra and can use geometry and trigonometry with little review. This course is a study of the traditional subject matter of classical physics: motion, energy, sound, wave motion, optics, electricity and magnetism. The emphasis in this course is on the mathematical and theoretical development of physical principles. Problem-solving and critical thinking are essential parts of this course. The principles and concepts are studied using graphical, algebraic, geometric, and trigonometric methods of analysis as well as laboratory experiments and demonstrations. This course is presented at a level comparable to many first year introductory college courses and uses a college textbook. The rigor of this course is significantly higher than in other levels.

Zoology and Botany (Zoobot) **4183**

Level:	College Prep
Prerequisite:	3 Science Credits
Open To:	Seniors
Length:	Year
Credit:	1

Zoology and Botany offers students an intensive study of the interrelationships, behaviors, and adaptations that allow for the biological success of animals and plants. The course encompasses an integrative approach to the study of innate animal behaviors and plant biology from organismal to community levels. Connections are made between animals and plants and their natural environment through classroom and fieldwork experiences. Effects of human influence and disturbance on the success of animal and plant species are analyzed. Students will become familiar with aspects of animal and plant care and maintenance, as well as behavioral research methods. Students taking this course are required to spend time outside of school hours assisting with the care of our resident animals as well as campus and greenhouse plants.

Zoology and Botany (Zoobot) **4187**

Level:	Honors
Prerequisite:	Biology, Physics & Chemistry
Open To:	Seniors
Length:	Year
Credit	1

This course offers students an intensive study of the interrelationship, behaviors, and adaptation that allow for the biological success of animals and plants. The course requires independent reading, portfolio creation, lab activity reports, and field work experiences. The course encompasses an integrated approach to the study of innate animal behaviors and plant biology from organism to community levels. Connections are made between animals, plants, people, and their natural environment through lab investigations and field work experiences. Students will become very familiar with aspects of animal and plant physiology, care, and maintenance, as well as behavioral research methodologies. Students are required to spend time outside of school hours assisting with the care of our resident animals in the animal room and plants in the greenhouse.

Geology and Astronomy **4312**
Level: Honors
Prerequisite: 2 Science Credits
Open To: Juniors, Seniors
Length: Year
Credit: 1

The fall geology portion of this course is concerned with the chemical and physical changes of the earth, considers the history, origin and characteristics of landforms, surficial and internal geological processes. The major premise of this study is to have students understand the constant physical changes the earth undergoes. The spring astronomy portion includes the study of the relationships of earth as a body in space, the scientific laws which govern the universe, our solar system and its origin, the structure and evolution of stars, the past and future of the universe, life in the universe and extraordinary celestial bodies. Learning activities include lectures, demonstrations, lab work, and written projects. The difference between this course and the College Prep level is the degree to which abstract ideas and numerical relationships are taught and the reading level of the textbook.

Microbiology **4172**
Level: Honors
Prerequisite: Biology & Chemistry
Open To: Juniors, Seniors
Length: Year
Credit: 1

This course allows students to experience a life-like laboratory experience. It is an introduction to the study of microscopic organisms, biogeochemical recycling, and microbial environmental factors. Historic and clinical lab techniques are used to classify and identify microbes. Students learn practical application of this knowledge to assess the danger of food poisoning and disease. The second semester involves the basics of epidemiology, virology, and immunology in the study of disease transmission, prevention, and the social response to epidemics. This course is laboratory and writing intensive. Evaluation is based on written exams, a lab notebook, lab participation and responsibility, article reviews, and research projects. The basic standards recommended by the American Society for Microbiology are incorporated into the curriculum. Students interested in careers in the medical profession or other biological fields will find this course beneficial.

Engineering Physics **4363**
Level: Honors
Prerequisite: Physics CP or H Grade of "B" or better, or consent of instructor; Physics AP-B Grade of "C" or better and consent of instructor.
Open To: Juniors, Seniors
Length: Year
Credit: 1

Engineering Physics is a vigorous course designed to encourage student application of scientific and engineering knowledge to real life situations. To be successful, students will have to research a given problem, design a solution that incorporates both scientific and engineering understanding, along with the construction of a corresponding project. Problem solving skills, scientific inquiry, and the engineering design process will be emphasized throughout this course. This course has been designed to encourage student exploration of multiple solutions to a single problem. Applied technology and science topics could include, but are not limited to: mechanics, aerodynamics, robotics, alternate energy, AC and DC circuits, power transmission, Rube Goldberg machines, and engineering economics.

Forensic Science **4701**
Level: Honors
Prerequisite: Biology, Physics & Chemistry
Open To: Juniors, Seniors
Length: Year
Credit: 1

This course offers extensive laboratory experience that integrates the concepts learned in biology, chemistry, and physics to strengthen individual skills in scientific reasoning and observation. Using inquiry based settings; students will learn basic scientific and mathematical methods and models required in forensic science. Representative skills are the determination of the force and motion of a vehicular crash, or the logical sequence of events through blood splatter analysis. The course also includes examination of physical evidence, correct crime scene protection and investigation, forensic entomology, and forensic anthropology.

AP Biology **4502***
Level: Honors
Prerequisite: Biology H and Chem
Open To: Soph, Jr, Sr.
Length: Year
Credit: 1

This course is taught at the college level and designed to prepare students to take the Advanced Placement Examination and score high enough to earn college credit in those colleges that recognize the examination. College level textbooks are used. The course will follow the College Board's syllabus: chemistry of life cells, cellular energetics, heredity, molecular genetics, and evolutionary biology, diversity of organisms, structure and function of plants and animals, and ecology. Since the College Board AP exam includes four essay questions, this course will require essay practice.

***Course #4501 for the class of 2013 and 2014**

AP Chemistry **4512***
Level: Honors
Prerequisite: Chem H
Open To: Soph, Jr, Sr.
Length: Year
Credit: 1

This is a college level course designed to prepare students to take the Advanced Placement Examination and score high enough to earn college credit in those colleges that recognize the examination. College level textbooks are used. The course covers such topics as kinetics, equilibrium, thermo chemistry, gases, acids, and basis. Laboratory work is included. Success in College Board Advanced Placement Chemistry is contingent upon a significant background in mathematics.

***Course #4511 for the class of 2013 and 2014**

AP Physics B **4524***
Level: Honors
Prerequisite: CP or Honors Physics and Concurrent enrollment in Honors Algebra 2/Trig or higher
Open To: Soph, Jr, Sr.
Length: Year
Credit: 1

Advanced Placement Physics B is a college level course designed for students taking the College Board Advanced Placement B Examination. This is a non-calculus based physics course that covers a very wide range of topics including mechanics, thermodynamics, fluids, waves and optics, electromagnetism, and atomic and nuclear physics. Laboratory work is included in this course and a university level textbook is used.

***Course #4525 for the class of 2013 and 2014**

AP Physics C **4522***
Level: Honors
Prerequisite: CP or Honors Physics and Honors Algebra 2/Trig or CP Pre-Calculus
Open To: Soph, Jr, Sr.
Length: Year
Credit: 1

Advanced Placement Physics C is a college level course designed for students taking the College Board Advanced Placement C Examination. This is a calculus based physics course that emphasizes the development of advanced physics concepts in mechanics, electricity, and magnetism and their applications in solving advanced physics problems. Students who plan to major in physics, astronomy, mathematics, or any type of engineering are strongly encouraged to take this course. Laboratory work is included in this course and a university level textbook is used.

***Course #4526 for the class of 2013 and 2014**

AP Environmental Science **4532***
Level: Honors
Prerequisite: 3 yrs of Science (Bio, Chem, Physics) or Bio, Chem, and concurrent enroll. in Physics
Open To: Juniors, Seniors
Length: Year
Credit: 1

Advanced Placement Environmental Science is an accelerated, college level course designed to provide students with the scientific principles, concepts, and methodologies required to understand the interrelationships of the natural world, to identify and analyze environmental problems, to evaluate the risks associated with these problems, and to examine alternative solutions for resolving and/or preventing environmental problems. There is an extensive field research component to teach students the skills and processes of experimental design, instrumentation, and data collection methods used in environmental science. At the end of the course, the student can take the College Board Advanced Placement exam. Scoring on this test may enable the student to receive college credit for the course.

***Course #4531 for the class of 2013**