



Upper School Course Catalog 2019-20

Preparing Boys for Life.

INTRODUCTION

The Haverford School is committed to preparing boys for life. Our college-preparatory educational program comprises academic, athletic, and community aspects that offers students both a broad exposure and grounding in several disciplines and the opportunity to pursue and develop more in-depth interests and an emphasis on the development of character and citizenship.

Choosing the course of study that is *best for you* requires thought and care. Students should consult parents, advisors, department chairs and administrators when choosing their courses.

The goal is to develop a course of study that:

- develops one's talents and aptitudes through a varied curriculum
- underscores talents and strengthens areas of relative weakness
- allows time for activities, sports and other extra-curricular activities
- challenges you to discover, develop, and expand areas of the liberal arts that can become sources of pride, joy and fulfillment and meets all graduation requirements.

New incoming students and families will work with the faculty, advisors, and the Head of Upper School in the course selection process. A new student entering the Upper School is placed in the appropriate level of math and language based on previous courses, testing, and consultation with the respective department chair.

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GRADUATION REQUIREMENTS

In the Upper School, a student must complete:

- **English:** 4 years
- **History:** 3 years (4 years recommended)
- **Modern and Classical Languages:** 2 consecutive years of the same language (3+ years recommended)
- **Mathematics:** 3 years (4 years recommended) in the proper sequence concluding with one of the following: Pre-Calculus or Pre-Calculus*, Statistics, Functions, Statistics, and Trigonometry or one of the courses with Calculus in the title
- **Laboratory Science:** 3 years
- **Fine Arts:** 2 full credits (see Fine Arts Requirement)
- **Sports or equivalent** (see Student Handbook):
 - 2 sports in Form III, IV, V
 - 1 sport in Form VI
- **Health and Physical Education:** 1 year in Form IV
- **Five core classes throughout each academic year**

	Form III	Form IV	Form V	Form VI
English	English I	English II	English III	English IV/*
History	Ancient World History	Modern World History	United States History/*	Electives Optional <i>Recommended</i>
Languages	Chinese, Spanish, and/or Latin	Chinese, Spanish, and/or Latin	Language Optional <i>Recommended</i>	Language Optional <i>Recommended</i>
Mathematics	Based on placement	Next in sequence	Next in sequence	Next in sequence
Science	Physics	Chemistry/*	Biology/*	Electives Optional
Fine Arts	Visual or Performing Arts	See Fine Arts Requirement	See Fine Arts Requirement	See Fine Arts Requirement
Additional	Form III Seminar/Study Hall	Physical Education/Health		

Courses that include a “/*” are offered as a standard and advanced level course.

COURSE OFFERINGS AND REGISTRATION GUIDELINES

- **Add/Drop:** The Add/Drop period occurs during the first two weeks of Semester 1 and during the first week of Semester 2. Courses cannot be dropped after the first marking period unless there are extenuating circumstances and only in consultation with the Head of Upper School, the appropriate Department Chair, and advisor.
- **Form III Seminar/Study Hall:** All Form III students are required to attend study hall when they are not in academic class. A portion of the study hall period will be utilized for Form III programming which cover various topics including: Diversity & Inclusion, Digital Citizenship, and Exploring Inclusion.
- **Health and Physical Education:** Health and Physical Education classes are required during Form IV. Each student will be scheduled for three periods per cycle for the entire Fourth Form year. All students are required to take Physical Education classes, even if they are playing or managing an interscholastic sport.
- **Honors Courses:** Advanced courses designated with an asterisk (*) must be approved by the student's current teacher and ultimately by the appropriate Department Chair. To qualify for an advanced course, a student must earn a grade of A- or higher in that discipline in the previous year. A course designated with an asterisk (*) is designed to provide a highly motivated, talented, passionate student with a rigorous academic experience that moves at an accelerated pace. Because we want every student to be successful, we are thorough and thoughtful in placing students in our most demanding (*) courses.
 - A student in an (*) course who does not earn a final grade of B or better will be reconsidered before he is permitted to matriculate to the next (*) course in the sequence. A student in a standard course who wishes to be considered for enrollment in a (*) course must earn a final grade of A-. Please note that these guidelines do not guarantee (*) placement. Additionally, some departments require readiness diagnostics (math placement exercise, writing sample, etc.,) and some departments, particularly those whose courses are cumulative in nature such as math and foreign language, may require a grade of A or above to advance from a standard to a (*) course. In all cases, the department chair, in consultation with the classroom teacher, is the final arbiter of student placement.

FORM III

FALL SPRING

English I

Fundamentals of Music: Theory & Guitar

Theatre I

Visual Art: Foundations

FORM IV

FALL SPRING

English II:
World Literature

Fundamentals of Music: Theory & Guitar

Advanced Guitar & Bass Guitar

Music Theory & History*

Music Comp: Trad. & Digit. Songwriting

Music Production & Recording

Theatre I

Theatre II

Visual Art: Foundations

2D Art

2D Art

3D Art: Design

3D Art: Design

Ceramic Arts

Ceramic Arts

Digital Arts & Technology

Digital Arts & Technology

Woodworking Arts

Woodworking Arts

FORM V

FALL SPRING

English III:
American Literature

Fundamentals of Music: Theory & Guitar

Advanced Guitar & Bass Guitar

Music Theory & History*

Music Comp: Trad. & Digit. Songwriting

Music Production & Recording

Theatre I

Theatre II

Theatre III*

Visual Art: Foundations

2D Art II*

2D Art II*

3D Art: Design II*

3D Art: Design II*

Ceramic Arts II*

Ceramic Arts II*

Digital Arts & Technology II*

Digital Arts & Technology II*

Woodworking Arts II*

Woodworking Arts II*

FORM VI

FALL SPRING

English IV

English IV*

English IV Seminars

Fundamentals of Music: Theory & Guitar

Advanced Guitar & Bass Guitar

Music Theory & History*

Music Comp: Trad. & Digit. Songwriting

Music Production & Recording

Theatre I

Theatre II

Theatre III*

Visual Art: Foundations

2D Art II*

2D Art II*

3D Art: Design II*

3D Art: Design II*

Ceramic Arts II*

Ceramic Arts II*

Digital Arts & Technology II*

Digital Arts & Technology II*

Woodworking Arts II*

Woodworking Arts II*

Art Portfolio*: 2D & Digital

Art Portfolio*: 3D Art

English

Fine Arts

The level I offering of the above Visual Arts courses is also available for enrollment during your Form V and Form VI years.

FORM III

FALL

SPRING

Ancient World History	
Algebra I	
Geometry	
Geometry*	
Algebra II	
Algebra II*	

FORM IV

FALL

SPRING

Required all year for three periods per cycle	
Modern World History	
Geometry	
Geometry*	
Algebra II	
Algebra II*	
PreCalculus	
PreCalculus*	

FORM V

FALL

SPRING

United States History	
United States History*	
Global Perspectives with Travel to Cuba	
Functions, Statistics & Trigonometry	
Algebra II	
PreCalculus	
PreCalculus*	
Calculus	
Calculus I*	
Software Prog. I	Software Prog. I
	Software Prog. II
Statistics (Form VI Priority)	
Statistics* (Form VI Priority)	

FORM VI

FALL

SPRING

European Dictators*	Contemporary International Relations
Government and Politics (Honors Option)	Modern Middle East History
Modern Black Lives	Modern Black Lives
Political Olympic History	Political Olympic History
Social Psychology	Social Psychology
	Global Perspectives with Travel to Cuba
Functions, Statistics & Trigonometry	
PreCalculus	
Calculus	
Calculus I*	
	Advanced Topics in Mathematics*
Calculus II*	Software Prog. I
Software Prog. I	Software Prog. II
	Economics: Micro*
Economics: Macro*	Finance: Portfolio Analysis
Finance: Theory of Interest	
	Statistics
	Statistics*

Health & Physical Education
History
Interdisciplinary Studies
Mathematics

Modern & Classical Languages

Science

FORM III

FALL SPRING

Chinese I
Latin I
Latin II
Latin II*
Spanish I
Spanish II
Spanish II*

Physics: A Conceptual Journey
Physics: A Problem Based Journey

FORM IV

FALL SPRING

Chinese II
Latin II
Latin III
Latin II*
Latin III*
Spanish II
Spanish III
Spanish II*
Spanish III*

Chemistry
Chemistry*

FORM V

FALL SPRING

Chinese III*
Latin III
Latin IV
Latin III*
Latin IV*
Spanish III
Spanish IV
Spanish III*
Spanish IV*

Biology
Biology*

Adv. Physics: Electricity & Magnetism*	Adv. Physics: Electricity & Magnetism*
Advanced Physics: Modern Physics**	Advanced Physics: Modern Physics**
Electronics*	Astronomy
Engineering: People & Processes	Engineering: Design, Build, and Test
Engineering*	Engineering*
Environmental Ethics	Environmental Ethics
	Electronics*

FORM VI

FALL SPRING

Chinese IV*	
Latin IV	
Latin IV*	
Latin V*Prose	Latin V* Poetry
Spanish IV	
Spanish IV*	
Spanish V Cine...	Spanish V Conv...
Spanish V* Latin...	Spanish V* Liter...
Ancient Greek	
Mythology	Mythology

Adv. Physics: Electricity & Magnetism*	Adv. Physics: Electricity & Magnetism*
Advanced Physics: Modern Physics**	Advanced Physics: Modern Physics**
Electronics*	Astronomy
Electronics*	Electronics*
Engineering: People & Processes	Engineering: Design, Build, and Test
Engineering*	Engineering*
Environmental Ethics	Molecular Biology*
Physiology*	Physiology

ENGLISH

Philosophy and Overview

The English Department is dedicated to educating boys to see the world around them clearly, critically, and sensitively. Through the study of literature, we strive to nurture young men to be thoughtful and generous forces in their communities and to be able to read, write, and speak with precision and power. As students examine literature, they encounter attitudes and lives that expose them to new perspectives. As they write analytical papers, personal narratives, and creative pieces, they build and explore their rhetorical and artistic skills. As they speak in small discussion groups and in formal presentation, they discover their own voices and learn to listen to each other.

The English Department program is structured in such a way that each student's sharpened critical awareness—in reading skills, in writing, and in oration—builds incrementally. As students learn to recognize linguistic structures and possibilities, they also come to understand the basic elements intrinsic to literature of all genres. We know that close observation of textual detail enriches the rhetorical quality of thinking, writing, and speaking. In our efforts to shape and sharpen our students' verbal skills, to expand their knowledge of literature, and to add to their general intellectual growth, we provide memorable and useful experiences. Such is our ambition: that our efforts and associations will instill habits and skills of lifelong value.

English I

This course seeks to ground students in the essential elements of effective reading, writing, and speaking. Two major objectives of the course are to teach students to read for meaning as well as pleasure and to teach them to express themselves clearly and logically through the written word. Writing assignments vary from analytical essays and personal narratives to journal entries and creative exercises. Most assignments emphasize revision and require multiple drafts. During the year students study and discuss works from many genres and examine how plot, character, theme, and language inform each other. Selections from Homer's *The Odyssey* or Shakespeare's *Othello* familiarize students with the background of the Western tradition, while providing a common base of reference for the future study of literature at Haverford. Other works in the recent past have included: *A Raisin in the Sun*, *Lord of the Flies*, *American Born Chinese*, and selections of short stories and poems. English I also includes a formal study of grammar, based on online resources, and vocabulary, largely based on *Wordly Wise 3000*.

English II: World Literature

This course exposes students to many genres of world literature and introduces them to the critical idiom. It places special emphasis on close reading and urges students to explore how figurative language, allusion, connotation, and imagery enhance meaning. Students hone these reading skills through sources as diverse

MUSIC

Philosophy and Overview

Participation in musical study and performance facilitates an appreciation for beauty, a means of self-expression, intellectual growth and a forum for positive community activity. We believe that one appreciates most what he understands and that one understands best what he has experienced. The music curriculum is experiential and has as its core musical literacy and artistry. Literacy is not an end unto itself; rather it is an avenue to artistry, understanding and appreciation. The curriculum is structured to prepare our boys for a lifetime of participation in the musical arts as performers or appreciative, well-educated audience members. Students have the option to pursue an intellectual study of music through the study of theory, guitar, recording and production, songwriting and history. Students may also pursue performance-based participation in the school's musical ensembles. Performance based study includes options in both vocal and instrumental realms. Students may audition for any number of ensembles, including Men's Choirs, String Orchestra, Chamber Music or Jazz Ensemble. Musical ensembles may be taken in fulfillment of the Upper School Arts Requirement. In addition, because of the physical and cooperative nature of ensemble work, yearlong participation in one of the school's musical ensembles may be used to fulfill one season of sports requirement. Two ensembles, Glee Club and Orchestra, are offered for academic credit.

Fundamentals of Music: Theory and Guitar

This is a yearlong introductory level course to understanding, reading, writing, and creating music. It is intended for students who want to pursue their passion for music but need help building a strong foundation of musical skills, concepts, and language. This course will function as a prerequisite for other higher-level music classes unless a firm grasp of the concepts and skills is demonstrated to the teacher. Students will be expected to begin their mastery of basic to intermediate rhythms in various time signatures, including rhythmic markings; note identification in multiple clefs in every key signature including ledger lines. Intervals, scales, triads, and seventh chords will be introduced both visually and aurally as well as popular song structures/forms, allowing for both analysis and composition of songs. In order to reinforce these concepts, students will be singing, playing the guitar, using MIDI keyboards, percussion, and using digital compositional tools such as Garage Band and Logic Pro.

Music Theory and History*

Prerequisite: Music Theory and Guitar or instructor approval.

This is a yearlong honors level course intended for the most musically proficient and inquisitive students. This is a two-pronged course in which we will cover collegiate level theoretical topics that are applicable to all styles of music. These skills will be reinforced through an intense study of music history. We will start in the medieval era and watch and listen to how music evolves throughout time up to the current hits that

are listened to today. As we listen to Gregorian chant we will find a better understanding of melody. The polyphony of the Renaissance will inform our understanding of chord progressions, while the Baroque era will be better understood through counterpoint exercises. While our understanding and appreciation of music deepens through our study of classical music, it culminates in applying all of these concepts to modern music. We will analyze what it is that makes music affect us the way it does and learn how to manipulate sound the same way great musicians have throughout history.

Advanced Guitar and Bass Guitar

Prerequisite: Music Theory and Guitar or instructor approval.

This is a yearlong course for all of the aspiring guitarists/electric bassists. It will teach the necessary techniques to allow students to learn and play intermediate to advanced repertoire in groups and as individuals. Some of the skills that will be covered are scales and modes in multiple octaves and fingering positions; chords in multiple positions across the fret board; fingerpicking exercises designed to increase speed, control, dexterity, and musicality and applying learned skills to repertoire from a diverse array of musical genres.

Music Production and Recording (*spring semester*)

Prerequisite: Fundamentals of Music: Theory and Guitar or instructor approval.

This course is for students interested in creating and recording music. This course will focus on digital music production and the art of recording music. Students will learn how to use a soundboard to mix music, how to use MIDI instruments and digital instruments to enhance their compositions, how to use music software to create their own compositions, how to set up microphones to record voices and/or instruments, and how to produce a finished product such as a digital album. Students will learn the basics of how to use the relevant technology and then put their compositional skills to the test.

Music Composition: Traditional and Digital Songwriting (*fall semester*)

Prerequisite: Music Theory and Guitar or instructor approval.

This course is designed to help students compose their own music. A brief study of some modern compositions will inform us, but the bulk of the course will be the art of writing your own songs. Students will learn how to compose using digital and traditional methods, but in the end will have significant authority in deciding what kind of music they are interested in writing. Students will learn the art of writing a good melody, the art of writing effective harmonies, understanding the texture, layering of multiple parts in music, analyzing the components of compositions from various genres, the technological aspect of using digital software to compose music including both music production software such as Garage Band or Logic and music notation software such as Finale and the art of lyric writing or being a librettist.

Glee Club

Students learn the technical aspects of good singing, including breath control, formation of vowel shapes and vocal tone, proper diction in a variety of languages, range extension and agility. Students study repertoire from a variety of genres, from classical to folk to jazz and modern. They perform a capella music as well as music accompanied by piano and orchestra. Through their rehearsal and performances, students learn a valuable skill that can be used as a form of self expression as well as a powerful form of communication. As the music is being rehearsed daily, various compositional techniques and elements of form are pointed out. Glee Club members participate in service learning through outreach performances. This chorus performs at four major concerts each year, at Haverford, in New York City, and in our community. The Glee Club joins forces with area girls' schools and with Haverford's boychoir to perform works such as Vivaldi's Gloria, Handel's Messiah, and Haydn, Mozart and Schubert Masses. Glee Club is a graded course that meets three times a week before school, 8:00 a.m. - 8:30 a.m. on Monday, Tuesday, Thursday, and Friday.

Orchestra

Orchestra is an auditioned ensemble. Students must demonstrate satisfactory ability on their principal instrument to participate, as determined by the director. Students learn to phrase artistically, and develop techniques of articulation, expanded dynamic range, and stylistic interpretation through performance of a range of repertoire covering multiple styles and genres. Orchestra members develop ensemble skills such as leading, critical listening, and collaboration. In addition, students refine technical skills on their given instruments. The Orchestra performs during the annual Haverford School performances. Orchestra is a graded course that meets three times a week before school, 7:45-8:20 a.m.

skill-building, research, and experimentation happening simultaneously. The work in Ceramics, as in all visual art classes, aims to strengthen students' ability to think and see critically, to develop a fluency in the visual language, and to become more adept at the creative process. Students can take both the fall and spring semester courses without repeating projects or can combine one semester with another semester art course.

Ceramic Arts II* (fall and/or spring semesters)

Prerequisite: Visual Arts Foundations and two additional semesters of arts courses preferred. Ceramics Arts II is a third level course open to students in the fifth through sixth forms.*

Students in this semester long course to build on the technical skills and processes from Ceramics I. Students will learn to mix glazes and the basics of firing kilns as well as advanced wheel throwing and handbuilding techniques. Complex functional forms such as Lidded Jars, Teapots and Nesting Bowls will be explored alongside figurative sculpture and modeling. Projects in Ceramics II* are designed to encourage the development of individual student voices reflecting their individual interests and pursuits. As with honors courses in other disciplines, significant time outside of class spent in the studio and or working at home is required. Students can take both the fall and spring semester course without repeating projects or can combine one semester of this course with another arts semester course.

Woodworking Arts (fall and/or spring semester)

Prerequisite: Successful completion of Visual Arts Foundations. Woodworking Arts is a second level course open to students in the fourth through sixth forms.

This course allows interested students the opportunity to explore the sculptural and functional aspects of design with wood. At the core of our work is developing an understanding for and a facility with the design process. This project-based course will build from simple construction methods with wood and wood tools and gradually expand the scope and skills used to create more complex forms, culminating in a project of the student's own design. Students will have the opportunity and expectation to work imaginatively while accomplishing the goals of each project. The use of hand and power tools as well as the qualities of selected woods will be a component of each unit. Students will learn the basics of linear perspective, orthographic perspective, and scale drawing techniques used by designers, architects and engineers. Students will maintain sketchbooks for planning purposes and a shared personal blog where they will document the progress of their work and learning. Although similar, each semester will vary enough for a student to take both semesters without repeating any material and to deal with increasingly complex ideas and techniques. Three instructors will team teach this course. Mr. Thorburn (Assistant Head), Mr. Ressler (Art Department) and Will Bryant (Theater) who all have unique experience with fine woodworking and building. Students can take both the fall and spring semester course without repeating projects or can combine one semester with another semester art course.

3D Art & Design II* (fall and/or spring semester)

Prerequisite: Visual Arts Foundations and two additional semesters of arts courses preferred. 3D Art & Design II is a third level course open to students in the fifth through sixth forms.*

3D Art & Design II* is a third level design and sculpture course that builds on the skills and concepts of three-dimensional sculpture and design begun in Foundations and 3D Art & Design I. Students will focus on technical skills and concepts needed to create three-dimensional functional and sculpture works through the manipulation of various 3D materials and media including wood, clay, wire, plaster, cardboard, and found objects. Extensive technical demonstrations will help students develop material interests and studio skills, including innovative uses of both manual and digital processes. Students will develop imaginative and creative solutions through a series of structured problem solving challenges as well as project proposals for independent projects. As an honors course, students will be expected to drive their own practice and find personal solutions to each project challenge. As part of the creative practice students will research, write, sketch, prototype and share ideas in meetings with peers and faculty. Projects will all culminate in a group critique followed by a written reflection, and some work will become part of exhibitions in and outside of school and entered into competitions. Students will be lead on studio tours around the Philadelphia area highlighting product design, architectural implementation and business sales.

As with honors courses in other disciplines, significant time outside of class spent in the studio and or working at home, where possible, is required. Students can take both the fall and spring semester course without repeating projects or can combine one semester of this course with another arts semester course.

3D Art Portfolio*:

Prerequisite: successful completion of four semester long courses. 3D Art Portfolio is intended for the most dedicated and experienced Sixth Form students only. An A- or better in 3D Art & Design II* is necessary for consideration.*

3D Art Portfolio* is our most advanced sculpture and three-dimensional design course, deepening the skills and processes generated in the 3D Art & Design II* course (see above description). Students will develop a sophisticated body of work with individualized areas of research, and a directed, productive approach to studio practice. We will have monthly meetings with faculty and guest artists, and off campus opportunities including field trips to exhibitions, museums, and artist studios will highlight professional practices in contemporary art in the vibrant Philadelphia area. Finally, the course will introduce students to the possibility of participation in major national competitions and exhibitions, self-promotion, and various creative opportunities. As with honors courses in other disciplines, significant time outside of class spent in the studio and/or working at home is required. Students can take both the fall and spring semester course without repeating projects or can combine one semester of this course with another arts semester course.

Digital Arts & Technology (fall and/or spring semester)

Prerequisite: Visual Arts Foundations. Digital Arts & Technology is a second level course open to students in the fourth through sixth forms.

In this semester long course, students will use a variety of technology based art and design mediums in service of effective communication in today's digital world. Spanning from traditional modes to cutting edge methods and software, students will solve complex visual design problems as they explore DSLR photography and photo editing, website design, graphic design, laser cutting, CAD & 3D printing, typography, video, and animation. An understanding of composition, color theory, and universal design will be cultivated as students engage in some projects that are centered around personal expression and others with a focus on design for commercial purposes. Students may sign up for fall and/or spring, as the two semesters will have different areas of focus. In the fall semester course, students will primarily explore photography, graphic design, laser cutting, and web design. The spring semester semester will focus more heavily on video, animation, CAD, and 3D printing. Students in both semesters will hone their digital literacy skills and confidence using emerging technologies. Digital Arts & Technology is can be taken full year or combined with any other semester long art course.

Digital Arts & Technology II* (fall and/or spring semester)

Prerequisite: Successful completion of Video/Animation and Photography or Visual Communication in a Digital World. Digital Arts & Technology is a third level course open to students in the fifth through sixth forms. Students in the semester long honors digital art course will work across a range of digital media developing personal responses to project challenges related to prevalent themes in contemporary art. Students will deepen their skills with technology based art mediums such as photography, graphic design, video, animation, CAD, 3D printing, and laser cutting as they explore ideas that are personally compelling and related to the contemporary world of art and design. Students will build on previous coursework as they develop their ability to use the visual language to communicate, persuade, inform, and connect. This honors course is designed for students who have developed the capacity to work in the art studio independently and are able to devote significant time to their projects outside of class. Students may take the course fall semester, spring semester, or full year without repeating projects.

HEALTH & PHYSICAL EDUCATION

Philosophy and Overview

The primary goal of the Health and Physical Education curriculum is to provide the boys with the framework necessary to develop and maintain a fitness plan that they can utilize for a lifetime. Through the health portion of the curriculum the boys are introduced to the five components of fitness and sound training techniques that will guide them in their quest for a personal fitness plan. Principles of diet and exercise and their effect on wellness are incorporated into this plan to allow the students to integrate this information into their program. Through the physical education curriculum, we aim to provide the boys with a variety of lifetime sports and activities that will give the boys the sport skills necessary to establish a lifetime commitment to a healthy lifestyle. We believe that a sound mind in a sound body is an ideal to aspire to and we strive to instill those values in the young men we teach. We also believe that regular daily activity is essential to a healthy cardio-respiratory system, and we try to have at least twenty minutes of vigorous activity each and every class.

Health & Physical Education

This course is required for all Fourth Form students. The class meets three times per cycle, and is divided into two separate curricula. The physical education portion occupies roughly two thirds of the year, with health education taking up the remaining one third. The physical education course introduces the boys to a variety of activities that will form the basis for their adult fitness program. The five components of physical fitness are applied to these activities to give the boys an awareness of the importance of wellness in their lives. The health portion of the course is devoted to current topics including communicable diseases, cardiovascular disease and cancer, how to develop and maintain health relationships, and certification in cardiopulmonary resuscitation. The current text is *“Get Fit, Stay Fit”* by William E. Prentice.

HISTORY

Philosophy and Overview

The History Department believes that the study of history and social science is at the heart of a strong liberal arts education and, therefore, vital to the development of the essential qualities of a Haverford School graduate. It is through the study of world in the contexts of time and space that a student can understand how the earth and humankind have come to be as they are today and to foresee how the lessons from the past can guide the interactions between peoples and nations in the future. Our core program is two years of global history followed by an in-depth study of United States history. Subsequent electives allow students to closely investigate topics of particular interest, including those in American and global studies, politics and government, and the Olympic Games. Throughout the program, students increase their curiosity, develop their capacity for critical and creative thinking, and expand their openness to new ideas and different ways of experiencing our common humanity.

The Department emphasizes the development of the following attitudes, attributes and skills:

- Read with an inquisitive, critical mind so as to explore material for authenticity and value
- Think critically so as to arrive at well-reasoned conclusions
- Communicate effectively orally and in writing
- Research effectively using both electronic and printed sources
- Apply sound note-taking, memorization, test-taking and other study skills
- Use technology to maximize learning
- Internalize an ethical, moral compass to guide decisions and actions
- Become a life-long student of history

The Department also recognizes the efficaciousness of using collaboration to educate boys by engaging them in major projects that involve research, writing, debating, and oral presentation skills. Among them are the Archeology Project (Third Form), the World War I Trials (Fourth Form), and the Madison Meetings (Fifth Form).

Ancient World History

This Third Form course is, at its core, an introduction to topics in ancient and classical civilizations. With a strong focus on historical analysis and foundational skills in the freshman year, the course will systematically address: effective reading of texts; note-taking, from both reading and class; writing the analytical essay; research techniques using library tools and methods; interpreting maps and other visual presentations; and making oral presentations, both formal and informal. The format of the course will include seminars, lectures, films/video, project-based learning, and other presentations.

Modern World History

In a survey of world history from the 13th century to the present, this yearlong Forth Form course will ask two intersecting and complementary questions: *what is “modern,” and what processes made/are making the world modern?* The course centers on the development and interaction of western and non-western civilizations over this period, examining significant ideas, events, and persons from the multiple perspectives of political, economic, and social history. The students will approach modern world history both chronologically and thematically, using the six themes of (1) interaction between societies, (2) change and continuity over time, (3) technology and demography, (4) social structure, (5) cultural and intellectual developments, and (6) states and political identities.

The course uses and refines the academic skills taught in Third Form Ancient History. Debates, historical trials (World War I), research papers, analytical essays, reflections, and oral presentations are among the methodologies used in this course.

United States History

This yearlong Fifth Form course covers the breath of American history from colonization to the present. Political, economic, and diplomatic developments are at the heart of the course, but social and intellectual history is covered as well. The course combines a traditional chronological approach with an emphasis on selected themes and topics including: the development of the United States as a world power; the socio-economic, racial, and ethnic diversity of American society; the development of the American political tradition (sectionalism, citizenship); and the role of government in the regulation of the economy. Readings include narrative history, news articles, primary sources, and other supplementary materials.

United States History*

Prerequisite: Recommendation of teacher.

This is an advanced version of the classic survey course in United States History. The course provides a foundation for a sophisticated appreciation of the history of the United States, beginning with the settlement of the colonies and ending with the present day. Events are studied within the historical contexts of chronology and geography. Students will acquire a critical lens for the understanding of contemporary issues, such as the tension among liberty, equality, and justice. College-level texts, advanced work with primary and secondary sources, and work in historiography are hallmarks of the course. Aside from preparing boys for success on national examinations, we hope to inspire an active and inquiring sense of citizenship.

European Dictators* (fall semester)

Prerequisite: A- in American History and recommendation of teacher.

This is a one-semester advanced course for Sixth Form students. It will focus on 20th century Europe between the world wars with special attention to the rise of totalitarianism and the conditions and events

that paved the way to power for Benito Mussolini in Italy, Joseph Stalin in the USSR, Adolph Hitler in Germany, and Francisco Franco in Spain. In addition to traditional history books such as *European Dictatorships: 1918-1945*, we will make use of memoirs such as Orwell's *Homage to Catalonia* and Levi's *Christ Stopped at Eboli*, Picasso's *Guernica* and Kampf's *Venus & Adonis*, and films like the Christopher Isherwood-inspired *Cabaret* and Leni Riefenstahl's classic and chilling documentary *Triumph of the Will*.

Government and Politics (fall semester)

This course will present an introduction to the study of government and politics. Our inquiries will begin with the intellectual and historical foundations of the western style of government. From there, we will learn about the organization of our own federal government, including the political forces that dictate its behavior, before discussing various Constitutional issues arising from current demographic, economic, and political trends. Finally, we will analyze the 2018 general elections in depth. This course will make use of various outside experts and speakers and will culminate in a final research project. As an **elective honors class**, students who wish to pursue the Honors designation must elect to do so within the initial drop-add period for the fall semester. "Honors" students will be expected to complete additional reading, research, and written assignments. Any student may choose honors, but he must meet clearly-defined progress points throughout the semester in order to maintain the honors designation.

Modern Black Lives: African American History: 1964-Present (fall or spring semester)

This course will explore questions related to the social and historical evolution of the history of Black America following the Civil Rights Movement of the 1960's. So often, African American Studies courses focus on the long period of Enslavement culminating with the legal codes that emanate from the Civil Rights Act of 1964. This course will use poetry, music, art and traditional historical primary sources to build the collective narrative of Modern Black Lives from 1964 to the present day. Anticipated units include: Political Messaging in the Civil Rights Era, Post Civil-Rights Urban Realities, Black Arts Movement (1970s); The Crack Epidemic and The War on Drugs (1980s); Hip Hop Politics (1990s); Black Music in the New Millennium; Black Lives Matter Movement (2010s).

Social Psychology (fall or spring semester)

This course for Sixth Form students examines the principles of social psychology: that is, how individuals think, feel, and behave in regard to other people and how individuals' thoughts, feelings, and behaviors are affected by others. The course will concentrate on the process of social thinking, such as motivation, leadership, conformity, obedience and persuasion, and social relations, including aggression, altruism, prejudice and attraction. General principles of coping, grouping identities, and social stress will be discussed. In addition to readings from the text, the course will include discussions of "case studies," film presentations and journal writing.

Political Olympic History (*fall or spring semester*)

This course focuses on the study of political conflicts through the lens of the Olympic Games. We will focus specifically on Olympic years in which the games were particularly controversial. We will begin with the first modern games in 1898; from there, we will examine the 1936 Berlin Olympics, Mexico City in 1968 (particularly under the scope of African American rights), Munich in 1972, and the boycotts of the 1980 and 1984 games in Moscow and Los Angeles. The course will conclude with an analysis of contemporary issues that impact the future of the Olympics.

Modern Middle East History (*spring semester*)

This one-semester elective provides an overview of the modern Middle East. This examination includes state and regime formations, international relations, and contrasting domestic politics. Additionally, the course will examine the theoretical roots of Islamic fundamentalism and its effect on the formulation, growth, and actions of radical Islamic terrorist organizations. We also will evaluate contemporary issues surrounding U.S. foreign policy as it pertains to the politics, economics, and conflicts of the Middle East.

Contemporary International Relations (*spring semester*)

The 21st century has been characterized by rapid change and increasing globalization, impacting individuals in societies in unprecedented ways and creating complex global political challenges. This one-semester survey course explores the intricacies of how global leaders in the international community must balance past interactions and future projections while making present choices. Using specific case studies and current events, as well as participating in a semester-long online simulation while competing for class credit, students will confront IR concepts in real time. Topics will include discussing different political theories, analysis of decision making, examining the role that international organizations play in today's global construct, and a survey of major geopolitical moments that have shaped the current world order.

MATHEMATICS

It is clear that the chief end of mathematical study must be to make the students think.

—John Wesley Young

Philosophy and Overview

The Upper School mathematics program sets forth clear, high-quality academic benchmarks that all **students must master by the end of each course. These are designed to exceed the Pennsylvania Common Core Standards** in their respective subjects. The Haverford School's expectations are rigorous, relevant to the real world, and reflect the knowledge and skills our graduates will need to be well prepared for the mathematical challenges in life beyond Haverford.

Each of our courses offers a comprehensive set of learning objectives with the common goal of developing competent problem solvers, effective communicators, independent learners, and confident critical thinkers; these are skills that extend beyond mathematics. We are committed on an ongoing basis to improving the mathematics offerings available to our students. To that end, our instruction and curricula are monitored and adjusted to best serve our charges – the future global citizens of the 21st Century.

The following course progression may be used to determine your plan for each year. Although not included in the chart, math electives are also available in Form V and VI.

Form II	Form III	Form IV	Form V	Form VI
PreAlgebra	Algebra I	Geometry	Algebra II	FST or PreCalculus
Algebra I	Geometry	Algebra II	PreCalculus	Calculus, Statistics, or Statistics*
Algebra I	Geometry*	Algebra II*	PreCalculus*	Calculus I* and/or Statistics*
Geometry	Algebra II	PreCalculus	Calculus	Calculus I*, Statistics, or Statistics*
Geometry	Algebra II*	PreCalculus*	Calculus I*	Calculus II* and/or Statistics*

About Algebra I and Geometry

Algebra is important as a modeling and problem solving tool, and it bridges the gap from computational mathematics to abstract understanding. Geometry introduces the spatial relationships that exist in two and three dimensions. The concepts learned in these introductory courses are used by each of us every day - albeit unconsciously - and form the foundation upon which subsequent math courses are built.

Algebra I

Algebra I is an introductory course designed for incoming Third Formers who have had little or no algebra or who need a thorough review of basic algebra. The topics explored during the school year consist of:

- Problem solving skills
- Variables and proportions
- Linear graphs and equations
- Multiple representations of linear situations
- Multiplications of algebraic expressions
- Solving systems of linear equations
- Quadratics, including factoring expressions, graphing functions, and solving equations
- Solving and graphing linear inequalities
- Simplifying rational expressions
- Using laws of exponents
- Using function notation
- Appropriate use of a graphing calculator for the topics listed above

Geometry

This course provides a comprehensive introduction to Euclidean geometry. A solid foundation in Algebra I is required. The topics to be covered will include:

- Foundations of geometry
- Polygons
- Circles
- Coordinate geometry with transformations
- Inductive and deductive reasoning
- Mathematical proof
- Congruence and similarity
- Area and volume

Geometry*

This course provides a thorough year long study of Euclidean geometry at an advanced level for qualified students from Forms III and IV. The course includes all of the foundational components of the standard course. Students will also be expected to connect concepts, and the most successful students will solve problems creatively. A mastery level understanding of Algebra I and a teacher recommendation are required to register for the course. In particular, the topics to be covered will include (but not necessarily to be limited to) the following:

- A rigorous treatment of mathematical proof
- Justification of the major theorems of the course

- Vectors
- Circle theorems

About Algebra II

The Haverford School offers two levels of Algebra II - Honors and Standard. The goal of each is to expand and deepen your existing knowledge of Algebra I and Geometry; both courses emphasize the computational and theoretical components of the subject matter. Successful completion of these courses will satisfy the Common Core requirements for Algebra (as set by the Pennsylvania Department of Education) and will prepare students to tackle more advanced coursework in the future.

Algebra II

Prerequisite: Geometry

This yearlong, standard level course is intended to meet (and surpass) the Common Core requirements. This is an exhaustive curriculum with particular emphasis on the practical/computational components of the subject and on the use of functions as mathematical models for solving real-world problems. In particular, the topics to be covered will include (but not necessarily limited to) the following:

- Properties of sets of numbers and number systems
- Solving equations, inequalities and absolute value problems
- Functions, relations, and their graphs
- Combinations and transformations of functions
- Inverse relations and functions
- Linear functions and systems of linear equations
- Quadratic functions and introduction to complex numbers
- Properties of higher-order polynomials
- Radical functions and rational exponents (roots and powers)
- Exponential and logarithmic functions
- Rational functions
- Functions as mathematical models
- Elementary probability

Algebra II*

Prerequisites: Geometry and teacher recommendation OR Standard Geometry with a grade of "A" for both semesters and both semester exams and teacher recommendation.*

This yearlong course covers the topics outlined above, but in a much more rigorous fashion. There are a number of additional topics presented as well. One of the distinguishing features of this course over its standard counterpart is the greater commitment in both time and effort required for success. This course

delves much deeper into the theory behind the basics and contemplates a wider range of topics. The curriculum reaches well beyond the Common Core requirements and prepares the students to tackle Precalculus at the honors level the following year. In particular, the topics to be covered will include (but not necessarily to be limited to) the following:

- Domain and range of functions and their inverses
- Systems of inequalities and absolute value equations
- Families of functions; transformations and graphs; end behavior of functions
- Quadratic equations (using advanced factoring techniques)
- Complex numbers/operations
- Systems of quadratic equations/inequalities
- Exponential and logarithmic functions using e and change of base
- Rational functions and their graphs – asymptotes, discontinuities, intercepts, roots and end behavior
- Conic sections – transformations and graphs
- Probability (combinatorics) and introduction to statistics (including binomial, geometric and normal distributions)
- Matrices (solving real-world problems with matrices)
- Linear programming (solving real-world problems)
- Functions as mathematical models (using technology/software to solve real-world problems)
- Periodic functions and trigonometry; trigonometric identities/equations

Functions, Statistics, and Trigonometry:

Prerequisite: Algebra II

This course provides a preparation for the study of Precalculus, geared toward those students needing further review of advanced algebra concepts. First semester topics include functions, transformations, polynomials, and rational functions. Second semester topics include exponential and logarithmic functions, unit circle, basic trigonometry, and an introduction to statistics. Real-world models are developed throughout. In particular, the topics to be covered will include the following:

- Exploration of data including tables, graphs, and plots, measures of center and deviation
- Functions and models including linear, quadratic, exponential, inverse, cubic and step Functions
- Transformations of graphs and data including translations and scale changes
- Circular functions including radian measure of angles, arc length and sector area, sine, cosine, and tangent and their graphs
- Trigonometric functions including the ratios in right triangles, the Law of Cosines and Law of Sines

- Root, power, and logarithmic functions including nth root function, rational powers and logarithms
- Probability and simulation including basic principles of probability, counting principles, permutations and combinations, Pascal's Triangle
- Sequences, series, including limits of sequences, arithmetic and geometric series

About Precalculus

Precalculus builds on the concepts from Algebra and Geometry to create the foundation for the study of calculus and is offered in Standard and Honors levels. This challenging course includes an examination of many types of functions including trigonometric, exponential, logarithmic, rational, quadratic, and higher - order polynomials. Students will be challenged to examine mathematics graphically, algebraically, verbally and numerically. The use of the graphing calculator will be required in this course, and students will be expected to know the five basic graphical functions: minimum, maximum, value, zero, and intersection.

Precalculus

Prerequisites: A grade of B or higher in Algebra II and teacher recommendation.

This course provides a comprehensive preparation for the study of calculus at Haverford or an introductory calculus course in college. This course requires a strong working knowledge of all the material from Algebra II, i.e. of linear, quadratic, higher-order polynomial, rational, exponential, and logarithmic functions. The concepts of trigonometry, sequences and series, and combinatorics will be developed. Mathematical models - solving real-world problems - requiring both algebraic and numerical methods will be emphasized throughout. Topics to be covered include:

- Brief review the following:
 - Functions - domains and ranges, graphs, transformations, composition, inverses and their applications
 - Polynomial and rational functions with emphasis on the Fundamental Theorem of Algebra and graphical methods
 - Exponential and logarithmic functions, their properties and applications
- Trigonometric functions - right triangle trigonometry, unit circle, fundamental trigonometric functions and their inverses, modeling and applications using trigonometry; graphs of sine and cosine functions
- Analytic trigonometry- using and proving trigonometric identities, solving trigonometric equations
- Advanced trigonometric concepts - Laws of Sines and Cosines, sum and difference formulas, multiple-angle formulas
- Introduction to vectors in the plane

- Linear systems and matrices - matrix operations and applications
- Arithmetic and geometric sequences and series
- Binomial expansion, counting principles, elementary combinatorics, introduction to probability theory
- Conic sections - circles, parabolas, ellipses and hyperbolas, their equations and properties
- Introduction to limits and continuity of functions

Precalculus*

Prerequisite: A grade of "B+" or better in Algebra II or "A" or better in Algebra II and teacher recommendation.*

This course covers all of the topics in Standard Precalculus with additional and/or enhanced coverage of conic sections, parametric equations, polar coordinates, vectors and the complex plane. Honors Precalculus is fast paced and requires a mastery of all previously studied skills. Connections with the sciences, economics and other real world applications are developed throughout. This course will also develop the student's skills in the use of the graphing calculator, in all of its modes. In particular, the topics to be covered will include (but not necessarily to be limited to) the following:

- Advanced trigonometric functions - graphs of tangent, cotangent, secant, cosecant and their inverses; half-angle formulas, product-to-sum formulas
- Advanced applications of conic sections - working from first principles, i.e. definitions of foci, directrices and eccentricity
- Parametric equations - graphs and applications
- Polar coordinates and graphing polar equations
- Vectors and vector operations in 2 and 3 dimensions - dot and cross product, components of vectors, lines and planes in 3-space
- Complex numbers - trigonometric form, De Moivre's Theorem
- Advanced treatment of sequences and series - tests for convergence of infinite series, mathematical induction
- Introduction to calculus - limits, continuity, tangent line to a curve

The following mathematics courses are primarily for Fifth and Sixth Form students and require departmental approval to enroll.

About Calculus

Inspired by problems in celestial mechanics, Newton and Leibniz developed the ideas of calculus more than 300 years ago. Since then, each century has extended the power of calculus to illuminate questions in mathematics,

the physical sciences, engineering, and the social and biological sciences. Calculus is a powerful tool for reducing complicated problems to manageable procedures.

The Haverford School offers two levels of calculus: Standard and Honors. The goal of both courses is to provide students with a clear understanding of the ideas of calculus as well as provide a solid foundation for subsequent courses. Both courses require a strong working knowledge of material from Algebra II and Precalculus, the ability to work independently, and include both computational and theoretical components.

Calculus

Prerequisite: A final grade of “B+” in Precalculus or the recommendation of your current teacher.

Calculus begins with a brief review of functions including logarithmic, exponential and trigonometric. After developing the ideas of limits and continuity, the course will focus on the major concepts of differential and integral calculus. Students will learn methods for taking derivatives and antiderivatives and use these methods in various applications. Although not as theoretical as Calculus I*, this course requires a strong working knowledge of previous courses, the ability to work independently, and a desire to learn higher mathematics. The students will use the graphing calculator as well as various online resources. In particular, the topics to be covered will include (but not necessarily limited to) the following:

- Limits of functions-- graphically and algebraically
- Definition of derivative-- instantaneous vs. average rate of change; slope and equation of the tangent line
- Differentiation techniques-- polynomials, trigonometric, and transcendental functions; implicit differentiation
- Applications of derivatives-- displacement, velocity, and acceleration; optimization; related rates
- Integration-- Riemann sums, definite and indefinite integrals, u-substitution
- Applications of integration-- area under and between curves; accumulation

Calculus I*

Prerequisite: A grade of “B” or above in PreCalculus and teacher recommendation OR a final grade of “A” in PreCalculus and teacher recommendation.*

This course is a thorough and challenging development of differential and integral calculus. In addition to numerous applications, this course includes a theoretical component and advanced methods of differentiation and integration that will not be covered in Standard Calculus. This course will prepare students to take Calculus II* at THS or move into a more theoretical calculus course in college, such as those required for mathematics, engineering or applied science majors. It is anticipated that students, having successfully completed Calculus I*, may successfully sit for the Calculus AB Examination in the

spring. In particular, the topics to be covered will include (but not necessarily to be limited to) the following:

- Limits of functions-- graphically and algebraically
- Definition of derivative-- instantaneous vs. average rate of change; slope and equation of the tangent line
- Differentiation techniques-- polynomials, trigonometric, and transcendental functions; implicit differentiation
- Applications of derivatives-- displacement, velocity, and acceleration; optimization; related rates
- Integration-- Riemann sums, definite and indefinite integrals, u-substitution
- Applications of integration-- area under and between curves; accumulation
- Differential equations
- Slope fields
- Exponential growth and decay models
- Simpson's Rule, Trapezoid Rule
- Additional integration techniques, integration by parts
- Volumes of revolution, disc, shell, and washer methods

Calculus II* (*fall semester*)

Prerequisite: Calculus I and teacher recommendation.*

This is a rigorous and fast paced one semester course which builds on the foundation of Calculus I*. Topics covered include applications of differential equation to physics, engineering, and biology, infinite series, parametric and polar representation, and the foundations of vector calculus. It is anticipated that students, having successfully completed Calculus II*, may successfully sit for the Calculus BC Examination in the spring. In particular, the topics to be covered will include (but not necessarily to be limited to) the following:

- Differential equations--separable equations, slope fields, Euler's Method, first-order equations and integrating factors
- Sequences and series--limits of sequences, numerical series, power series, Taylor series
- Parametrically defined curves - slope and arc length
- Polar curves--slope and area in polar coordinates
- Vector-valued functions--position, velocity, and acceleration in the plane

MATHEMATICS ELECTIVES

Advanced Topics in Mathematics* (*spring semester*)

*Prerequisite: Grade of B or higher in Calculus II**

In this semester course we will explore the foundations of linear algebra and multivariable calculus, interweaving topics drawn from both subjects. We will begin with a study of three-dimensional vectors, continue on to matrices and determinants, and conclude with a treatment of functions of several variables, including partial differentiation, gradient and directional derivative, optimization, multiple integrals, and vector analysis. Applications will be drawn from physics, economics, and engineering.

About Statistics

In a society inundated with information, the ability to analyze and interpret data is an invaluable tool. Statistics provides the opportunity for students to learn how to make good decisions with data. Statistics permeates every branch of the natural and social sciences, and the ability to make inferences from statistical analysis is crucial in business, economics, political science and medicine. It is very likely that you will be required to take a statistics course in college and then use it in your career. The Haverford School offers two levels of statistics: Honors and Standard. Both courses are designed to meet (and exceed) the Data Analysis Core Curriculum requirements (as adopted by the Pennsylvania Department of Education); both will include computational and theoretical components dealing with descriptive and inferential statistical techniques. Students will be introduced to the major concepts and tools for collecting, analyzing and drawing conclusions from data. Students are exposed to four broad conceptual themes:

- *Exploring Data: Observing patterns and departure from patterns*
- *Planning a Study: Describing what and how to measure*
- *Anticipating Patterns: Producing models using probability theory and simulation, and*
- *Statistical Inference: Confirming models.*

Statistics

Prerequisite: Completion of Precalculus with a grade of B or Precalculus and a teacher recommendation.*

This yearlong course is intended to provide students a framework to think about the world “statistically.” Real-world problems will be solved using 21st century methodologies, i.e. by incorporating useful technologies and working collaboratively; the process will be project-based, highly interactive, and engaging. This course is open to V and VI Form students. It is ideally suited for students who have completed FST or Precalculus and are now looking to expand their mathematical horizons. The course utilizes an online textbook for readings and exercises.

Statistics*

Prerequisite: Completion of Precalculus with a grade of B+ or Precalculus and a teacher recommendation.*

This is a yearlong comprehensive survey of the foundations of probability theory and statistical methods for collecting, organizing, displaying, analyzing and drawing conclusions from data. Emphasis is placed on clear and accurate reporting of the results obtained from these activities. Statistics* is a demanding course

(both in time commitment and complexity), open to qualified Form V or VI students who wish to study statistics at a level comparable to a rigorous college course. It is anticipated that students, having successfully completed Statistics*, may successfully sit for the AP Examination in the spring. Technology will be used extensively for solving problems in the course. No specific textbook shall be required (although classroom copies of *Stats: Modeling the World* by: Bock, Velleman & De Veaux will be available for reference). Students may take this course concurrently with Calculus, Calculus I* or Calculus II*.

About Finance and Economics

Making sound financial decisions is an essential life skill, yet most people acquire it only with age and through a process of trial and error. Studying Finance and Economics will equip students with powerful mathematical and decision-making skills to help them take control of and proactively map their lives in an uncertain world. Clear financial and economic thinking will yield benefits for students of these subjects, as well as for society-at-large.

Finance: Theory of Interest (*fall semester*)

Prerequisite: Algebra II

Open to VI Form students, this course explores the theories and applications of both simple and compound interest. We will learn the basics of general annuities and perpetuities; amortization tables and sinking funds will be developed; bonds and equity instruments will be compared and contrasted, and capital budgeting will be discussed. In addition to valuing various financial securities using both simple and compound interest, this course analyzes current events and their impact on the markets. A major goal of the course will be to teach students effective problem-solving techniques using real-world transactions. Technological solutions to all of the problems will be emphasized. No specific textbook shall be required (although classroom copies of Schaum's Outline - *Mathematics of Finance* will be available for reference). Theory of Interest is offered in the fall as a stand-alone course; taking Portfolio Analysis in the spring is not required, although it is desirable.

Finance: Portfolio Analysis (*spring semester*)

Prerequisite: Algebra II

Open to Sixth Form students, the main objective is to provide students with a sound understanding of the concepts and practices associated with making sound investments. We will contemplate topics such as: financial statements, financial instruments, the markets and related indices, risk and return vs. pricing theory, performance evaluation, and efficient diversification. A wide variety of securities will be discussed. Among them are: common stocks, bonds, mutual funds, real estate, options and tax-advantaged investments. The capstone project for the course will be the design, construction, and management of a hypothetical portfolio by the students. This course additionally examines the impact of current events on a weekly basis. Students will evaluate various current events and examine the positive or negative results

on stock price, market indices, and the economy as a whole. All of the required reading material is available online, so no specific textbook will be utilized. Portfolio Analysis is offered in the spring as a stand-alone course; taking Theory of Interest in the fall is not a prerequisite, although it is helpful.

Economics: Macro* (fall semester)

Prerequisite: Students must be enrolled in or have completed a Calculus course.

This conceptually challenging VI Form elective covers the main ideas of macroeconomics, the study of the large-scale structure of the national and world economy. The mathematical level is comparable to that of an introductory college class in macroeconomics. Topics include national income accounting (GDP), economic growth, unemployment and inflation, the financial sector, money and banking, aggregate supply and demand, fiscal and monetary policy, and international finance.

Economics: Micro* (spring semester)

Prerequisite: Students must be enrolled in or have completed a Calculus course.

This mathematically demanding VI Form elective covers the main ideas of microeconomics, the study of the decision-making processes of consumers and producers in a market economy. The mathematical level is comparable to that of an introductory college class in microeconomics. Topics include market equilibrium, elasticity, taxes and price controls, international trade, consumer and producer decisions, competition and monopoly, and externalities, such as pollution and global climate change.

Software Programming I (fall and spring Semester)

Prerequisite: Algebra II

The course focuses on the software development life cycle through exploring and utilizing the Python programming language. Students will have the opportunity to develop their own projects. They will be responsible for determining the scope of a project, design a solution, program the application, test and debug. It is expected that students will master algorithm building and develop their understanding of the object oriented nature of Python. Three to four hours of work per week dedicated to practicing and mastering this material can be expected.

Software Programming II (spring semester)

Prerequisite: Teacher recommendation and completion of SPI with a B or higher. Students must demonstrate a strong work ethic and a history of consistent homework and project completion to qualify.

Students will learn to identify interesting problems that can be addressed with software. They will explore Python's usage of classes and objects and use them in programs they build. Working as a collective is an essential skill for future programmers and students taking this course will learn to develop this skill and practice it regularly.

MODERN & CLASSICAL LANGUAGES

Philosophy and Overview

The Modern and Classical Languages Department prepares boys for a future in the global community. In order to create the best target language experience for our students, we seek to cultivate a program that incorporates the following interconnected principles:

Cultural understanding and empathy: The study of languages beyond English provides a unique opportunity to not only gain perspective on cultures separated from ours in space and time, but also better understand our own. Our culture-centered language curriculum, while maintaining rigorous linguistic standards, intentionally teaches our boys empathy and appreciation for diversity.

Language acquisition: Our program provides the opportunity for students to become proficient at reading, writing, speaking and listening in the respective languages. To achieve these proficiencies, we provide a learning environment that fosters intellectual risk-taking and problem-solving skills.

Incorporation of authentic experience: We put the study of language in context by incorporating meaningful, real life resources into the curriculum. We value experiences beyond our school walls, both in the local community and abroad, and strive to provide opportunities for our boys to travel.

CHINESE

Chinese I

This introductory course is offered to students with little or no prior experience in Mandarin Chinese. Basic background information of the language such as tone graphs, pinyin, and formation of characters will be introduced. Vocabulary, grammatical structures, and cultural references will be taught and discussed at an elementary level. Students will learn to read simple passages and write in simplified Chinese characters. In the second semester, students will engage in basic communicative tasks related to daily settings. This course is mostly conducted in Chinese, with the exception of addressing important and difficult concepts.

Chinese II

Prerequisite: successful completion of previous level and department approval.

This course continues to build on skills, comprehension and proficiency developed previously in Chinese I. More vocabulary and grammatical structures will be introduced. Students will be equipped with the ability to communicate with native speakers in everyday settings and sustain meaningful conversations. Emphasis will be placed on performing culturally authentic and pragmatic communicative tasks.

Chinese III*

Prerequisite: successful completion of previous level and department approval.

This course continues to build on skills, comprehension and proficiency developed previously in Chinese II. More vocabulary and grammatical structures will be introduced. Students will be equipped with the ability to communicate with native speakers in everyday settings and sustain meaningful conversations. Emphasis will be placed on performing culturally authentic and pragmatic communicative tasks. Chinese is the main medium in the classroom and in casual situations throughout the school day.

Chinese IV*

Prerequisite: successful completion of previous level and department approval.

This course continues to refine students' listening, speaking, reading and writing skills previously developed in Chinese III*. Conversations and discussions will be based on socially and culturally authentic context and materials. Students will learn to compose descriptive passages using advanced vocabulary, sentence structures, and both traditional and up-to-date idioms that have substantial reflection on Chinese current affairs. Toward the end of the course, students will learn about contemporary China through Chinese cinema and ancient Chinese philosophy and its modern application.

LATIN

Latin I

This introductory course examines the linguistic, cultural and historical traditions of the Greco-Roman civilizations. As a way to foster clear and logical thinking, Latin grammar, syntax and translation form the core of study. Since Latin is a basic constituent of the English language, the course examines vocabulary with particular emphasis on English derivatives and related definitions. Students also study mythological, historical and cultural themes in order to broaden their appreciation of the foundations of Western civilization.

Latin II

Prerequisite: successful completion of previous level and department approval.

This course, offered to students who have completed Latin I in the Middle or Upper School, reviews the fundamentals of Latin I and introduces more sophisticated grammatical concepts requisite for success at the intermediate level. To introduce the art of translation, fables and mythological stories are read, as well as adapted selections from ancient literature. Emphasis is placed on precise analysis and expression in preparation for reading the original works of the Latin writers in Latin III.

Latin II*

Prerequisite: A in Latin I and department approval.

Students who choose this course should be especially eager to continue their study of Latin and classical literature. While including the elements described for Latin II, the pace and depth of the curriculum are aggressive and presume an avid enthusiasm for scholarship. Students will complete the majority of Latin grammar while reading and translating extensive selections from classical and medieval literature. In addition, students will study the history and culture of ancient Rome in depth, using archaeological and epigraphic as well as literary sources.

Latin III

Prerequisite: successful completion of previous level and department approval.

This course continues with the mastery of sophisticated grammatical concepts which are studied in the context of historical writings. With the text Duces Romanorum the students examine ancient Rome with an emphasis on its greatest leaders from its founding through the Republic. In the spring, particular emphasis will be placed on the works of Caesar..

Latin III*

Prerequisite: B in Latin II and department approval*

This course allows the student to apply his knowledge of Latin grammar, syntax and vocabulary to the reading, translating, analyzing and understanding of Latin literature from the late Republic. Particular emphasis will be placed on the works of Caesar and Cicero. In conjunction with our translations, students will study the literary, cultural, intellectual and historical contributions of the ancient Roman world. This course, in comparison with the Latin III course, proceeds at an enhanced pace and depth. .

Latin IV

Prerequisite: successful completion of previous level and department approval.

Students study the traditions of ancient epic by reading the Iliad, its ancient Latin translation, the Ilias Latina, and Vergil's epic poem The Aeneid. Selections are translated from the Latin, while other passages are examined and discussed in English. In addition to mastering Latin epic meter, students become familiar with Latin poetic style and its place in the Western literary canon. Through extensive translation and textual analysis, students develop their confidence in reading at sight and, by writing short papers and giving oral reports on relevant topics, they enhance their appreciation of poetic artistry.

Latin IV*

Prerequisite: B in Latin III and department approval.*

Students study Vergil's epic poem The Aeneid in its historical setting as well as in its place within the traditions of epic genre. Selections are translated from the Latin, while other passages are examined and

discussed in English. In addition to mastering Latin epic meter, students become familiar with figures of speech and the Vergil's unparalleled poetic style. Through extensive translation and textual analysis, students develop their confidence in reading at sight and, by writing short papers and giving oral reports on relevant topics, they enhance their appreciation of Vergil's artistry. This course, in comparison with the Latin IV course, proceeds at a greatly enhanced pace and depth.

Latin V* Prose (*fall semester*)

Prerequisite: department approval, B in Latin IV or successful completion of Latin IV.*

In this course students will have the opportunity to read and study a variety of Roman prose writings including history, political commentary, philosophy and letters. The works of authors such as Livy, Tacitus, Suetonius, Caesar, Cicero and/or Pliny will provide the basis for a more thorough understanding of the Roman Republic and Empire. The prose selections will enable students to improve both their reading fluency and literary analysis skills as they gain a better appreciation of Roman culture, history and literature.

Latin V* Poetry (*spring semester*)

Prerequisite: department approval, B in Latin IV or successful completion of Latin IV.*

In this course, students will have the opportunity to read and study a range of Roman poetry including epic, lyric and satire. The works of authors such as Ovid, Catullus, Martial and/or Juvenal will offer the student insights into Roman thinking about politics, love, everyday life, mythology and poetry. The poetry will enable students to improve both their reading fluency and literary analysis skills as they gain a better appreciation of Roman culture, history and literature.

SPANISH

Spanish I

This course is designed for the student who has had little or no prior exposure to the Spanish language. It emphasizes the acquisition of fundamental practical vocabulary, a solid foundation in basic grammatical structures, a detailed study of the verb system and the development of sound pronunciation and speaking skills.

Spanish II

Prerequisite: successful completion of previous level and department approval.

Students enrolled in this course have successfully completed Haverford's first year of the language. In Spanish II, students will continue to build a solid foundation in the fundamentals of grammar and in the acquisition of a practical, useful, contemporary vocabulary for oral and written communication in a variety of everyday situations. Furthermore, through various cultural explorations, students will continue to expand their knowledge of Hispanic cultures. Students participate in daily oral drills, complete

translation exercises, read short passages and write one-page compositions. Throughout the year, the students continue to expand their vocabulary and strengthen their precision both in speaking and writing, and gain mastery of the future, conditional, imperfect and perfect tenses.

Spanish II*

Prerequisite: A average in Spanish I and department approval.

Students enrolled in this course have successfully completed Haverford's first year of the language, and are prepared for the significantly faster pace of this course. Students in this class will master the future, conditional, imperfect and perfect tenses of the indicative mood, and will also undertake a thorough study of the present subjunctive. The class will be conducted almost entirely in Spanish, unless the explanation of a complex grammatical concept demands otherwise. Students will engage in oral drills, and translation exercises, and will create presentations and one-page compositions. The class will read and discuss short literary passages and current articles relevant to Hispanic culture.

Spanish III

Prerequisite: successful completion of previous level and department approval..

Students enrolled in this course have successfully completed Haverford's Spanish II curriculum. Spanish III begins with a thorough review of grammar covered in the second year. Students will then continue their study of more complex grammatical structures. Students will read longer passages, and sections of authentic literary works, and will engage in class discussion primarily in Spanish. In Spanish III, students complete their study of the Spanish verb system, and begin to apply their skills to a variety of exercises designed to promote greater fluency in spoken and written Spanish.

Spanish III*

Prerequisite: B average in Spanish II and department approval.*

This course is designed for students who have successfully completed Haverford's Spanish II* curriculum. Emphasis in Spanish III* is divided among five basic language skills: listening comprehension, speaking, reading, writing, and cultural understanding. This third-year course begins with a review of second year skills and introduces appropriate new material to help students improve their command of grammatical structures, active and passive vocabulary, and comprehension of both literary and non-literary written Spanish. Short stories, films, and newspaper articles are incorporated into the curriculum, in order to foster greater understanding of Hispanic culture, and to help the student develop the skills necessary to express himself in spoken Spanish. Students in Spanish III* make the transition from sequential materials used at the previous levels of language instruction to the ability to express themselves creatively in oral and written Spanish.

Spanish IV

Prerequisite: successful completion of previous level and department approval.

The objective of this course is to help the students to convert the linguistic skills acquired during the three previous years into a coherent, clear, and useful means of communication. It prepares students to converse at length and handle everyday situations with confidence. Students view films in Spanish, and read literary works from world-renowned Spanish and Latin American authors. They also use the Internet, magazines and newspapers to read about current events in the Spanish speaking world. The films, literary readings and articles are the basis for classroom discussion and provide students with a general understanding and appreciation for the Hispanic culture. By the end of this course the student should have developed the self-assurance and confidence necessary for using the target language in informal conversations, or before a variety of audiences, ranging from a small circle of friends to a full class.

Spanish IV*

Prerequisite: B average in Spanish III and department approval.*

This is an interactive course involving advanced vocabulary and grammatical structure, as well as intensive study and usage of the Spanish language. Students in this class will continue to develop greater proficiency in all four language skills: listening, reading, writing, and speaking. Students in Spanish IV * will discuss contemporary news, cultural topics, literary readings, and films in Spanish. The goal of this course is to help students achieve fluency, and, as such, it will enable students to communicate with greater confidence, giving them the tools they need to handle day-to-day situations in a contextualized setting.

Spanish V: Cine del mundo hispano (fall semester)

Prerequisite: successful completion of previous level and department approval.

This course addresses themes relevant to the 21st century in the Hispanic world, many of them polemic in nature. Topics include immigration, oppressive government regimes, global responsibility and regionalism versus globalization. Students learn the skill set necessary to watch, understand and interpret Hispanic film and ultimately enabling the students to view films critically and as empathetic global citizens. Advanced grammar and vocabulary will be reinforced through discussion and composition.

Spanish V: Conversación y Controversia (spring semester)

Prerequisite: successful completion of previous level and department approval.

In this semester-long course, students will explore global issues through the literature, art, history, politics, film, and culture of the Spanish-speaking world. Particular emphasis will be placed on developing speaking skills, but students will be required to complete nightly readings in order to participate effectively

in class. Readings will be aimed at helping students develop cultural empathy and an understanding of current world events, and will include newspapers, blogs, and other internet sources, as well as literary works. In addition to daily class participation, students will be expected to work individually and in groups on diverse oral projects such as podcasts, Powerpoint presentations and debates. Additionally, several films will be chosen to complement the themes of the texts explored in class.

Spanish V*: Latinoamérica en el siglo XX (fall semester)

Prerequisite: B average in Spanish IV and department approval.*

This advanced class will use the literature, art and film of the last century to explore the role of political and economic events in the Spanish-speaking world, in particular the political changes, economic crises and social movements that have influenced and affected countries such as Chile, Guatemala, Venezuela, Cuba, Argentina and México. The content of this course will be tailored to student interest and current events. Students will be exposed to the unique voices of short story writers, journalists, poets, artists and filmmakers whose work was informed by these events. Students will also gain insight into the socio-political antecedents and repercussions of these critical events.

Spanish V*: Literatura y cultura latinoamericana (spring semester)

Prerequisite: B average in Spanish IV and department approval.*

In this course students will explore Latin American culture through literature. The short stories of such authors as Rulfo and Márquez will transform the reader's understanding of the human experience. This advanced course is dedicated to reading and interpreting literature of the Spanish speaking world with particular emphasis on the short narrative. Immersed in the target language, students will participate actively in discussions and write reflections on literary and social justice topics. Students will explore the historical, cultural, and literary influence of various authors from all over Latin America and Spain through the 21st century.

CLASSICS ELECTIVES

Ancient Greek

Prerequisite: department approval.

This course will endeavor to immerse the student in the rich intellectual, cultural, historical and literary heritage of ancient Greece, with particular emphasis on Athens in the fifth century BC. Through daily reading of ancient Greek, the students will gain mastery of grammatical concepts, acquire a substantial, working vocabulary and attain proficiency in translation. Initially reading Greek passages adapted from such Classical authors as Herodotus, Thucydides and Aeschylus, by the end of the course we will be reading those same authors in the original. We will also be exploring additional literary traditions by reading several Greek tragedies in translation. The students will be encouraged at all times to examine and reflect upon the myriad of contributions that the ancient Greeks have made to Western Civilization.

Mythology (*fall or spring semester*)

Though we are separated from the ancient Greeks by millennia, Greek mythology continues to play an important role in shaping and understanding our culture. In this class, we will become familiar with major stories and themes from Greek myths, as well as examine how myths are structured, how people use myths to understand their experiences, how societies apply myths to political purposes, and how myths are depicted in ancient and modern art. No knowledge of Latin is necessary to enjoy and succeed in this class. [This is a Classics course. Knowledge of Latin is **NOT** required.]

SCIENCE

Philosophy and Overview

The Haverford School Science Department strives to produce graduates who demonstrate a well-developed scientific intellect. Crucial to this goal is the development of critical thinking and the ability to synthesize and analyze available information. Possessing those tools, the boys can then apply their knowledge to the integration of concepts within the realm of science and across disciplines. We want the boys to understand that science is an active and ongoing process. We mold active learners who are capable of independent, cooperative, and collaborative work using the available technology and tools. We emphasize the students' status as global citizens, including but not limited to the stewardship of their environment, ethical decision making, and possessing comprehensive historical perspective. We consistently model for and try to instill in the boys, personal qualities that will sustain open-mindedness, creativity, imagination, and curiosity. By supporting informed risk-taking and encouraging the patient pursuit of goals, we look to cultivate persevering, hard-working students who will possess the confidence and resiliency to continue their study of science regardless of obstacles they may encounter. Through this process we hope to nurture and help the boys sustain the inherent awe, passion, and wonder that science can inspire.

Physics

The Haverford student sets out on his Upper School science journey with an exploration of fundamental physics, laying the foundation for in-depth explorations of chemistry and biology. Third Form students will have a choice between a conceptual or a problem based approach. The two physics courses are designed around a project-based curriculum and strive to be the cornerstone in our development of scientifically literate graduates who appreciate science and are curious about the natural world. Both courses are structured around pillars of physics such as Newton's Laws, the Law of Conservation of Energy, and electricity and magnetism. Both approaches provide the student with the opportunity for intellectual investigation, tactile experience, and the development of appropriate and vital critical thinking and problem-solving skills. The students, through individual and collaborative work, will engage in laboratory research, reading, writing, problem-solving, and relevant and creative projects. **Successful completion of one of these courses is required of all Third Form students.**

Within the construct described above we incorporate project-based inquiries that allow students to explore foundational aspects of topics that could include applications of engineering, robotics, programming, and collaborative problem-solving. Centered around the concepts and phenomena discussed in class, these open-ended experiences help to further develop the skills of scientific problem-solving and reasoning that will be relevant to their future science classes and their lives well beyond Haverford. Therefore, class time is often devoted as much to laboratory study and peer discussion as to

the more traditional lecture and recitation. The student learns to write formal laboratory reports in the format expected throughout his Upper School science experience and beyond. During his laboratory exercises, the student will be required to capture data, work collaboratively with colleagues, and use imagination, ingenuity, and creativity to solve the practical problems presented.

Physics-A Conceptual Journey

This physics course is conceptually challenging while supporting development of essential problem-solving skills. Detailed, challenging, and in-depth projects, modeling, and collaborative experiences will be the primary modes of exploration with the intentional and appropriate incorporation of mathematical principles. Third Form students will have the opportunity to develop or reinforce their mathematical problem-solving skills at the Algebra I level. Physics concepts will be explored through the perspective of how they relate to real world problems and issues. Mathematical and problem-solving skills will be incorporated as needed within the context of the conceptual foundation that forms the fundamental structure of the course. It is designed to challenge each boy to stretch and grow through scientific inquiry, collaboration, concept mastery and appropriate mathematical applications.

Physics-A Problem Based Journey - *Co-requisite: Concurrent enrollment in Geometry* or higher or permission of the Department Chair.*

This course is designed to build the same foundation as the conceptual journey with an emphasis on a deeper and broader mathematical exploration. Mathematical concepts will be essential in forming the basis of the conceptual foundation in physics. It is designed with the intent of offering those boys who really enjoy the challenges of establishing a clear and lasting connection between the conceptual foundation and the mathematics that predict and define their physical experiences in the world around them.

Both courses will provide a thorough and challenging exploration of fundamental physics while providing the student with the opportunity to master the essential mathematical skills needed for success in both levels of Fourth Form chemistry.

Chemistry

The second of three **required** courses, Chemistry is an integral component of Haverford's Upper School science sequence. Like Physics, Chemistry emphasizes problem-solving strategies, experimentation, teamwork, project-based activities, and the fundamental principles of physical science. To that foundation it adds an understanding of modern theoretical concepts, the relationship between structure and function, multi-step calculations, and qualitative and quantitative laboratory work. All Chemistry courses provide students with an understanding of basic chemical concepts: atomic and molecular structure, periodic properties of elements, reactions, stoichiometric calculations, thermochemistry,

solution chemistry, acids and bases, and equilibrium. We expect students who have completed a course in chemistry to have a firm grounding in experimental procedures, calculations, basic error analysis, and lab report writing skills. Students should also be able to manage an appropriate schedule of reading, problem solving, preparation, and participation. Calculators and computers with related software are frequently used for problem solving and data analysis. Chemistry is an important prerequisite for the biology course which students customarily complete in their Fifth Form year.

- **Chemistry** - This is a broad introduction to, and overview of, the general principles and problem-solving techniques in the study of the composition of substances and the changes these substances undergo. The course focuses on building a solid and thorough foundation of fundamental chemical principles through a project-based curriculum. A high value is placed on students engaging in challenging laboratory and collaborative in-class activities. Individual reflection on their experiences is an essential component in support of the acquisition of disciplinary knowledge and skills. In this context, real world phenomena are used to frame student experiences and serve as the basis for the curriculum. Students are assessed both formatively and summatively on classroom participation and content application and mastery with a focus on developing cooperative learning skills. The course touches on all of the five major branches in chemistry: inorganic, organic, analytical, physical, and biochemical.
- **Chemistry*** *Prerequisite: Successful completion of Geometry and an established record of dedication to fulfilling course requirements and a conscientious commitment to excel. Completion of Physics with a final grade of A or better and endorsement of the Physics and Math instructors, with approval of the Science Department Chair. It is advantageous to have completed Algebra II before enrolling in this course. However, students may enroll in Chemistry* while concurrently enrolled in Algebra II provided they have the endorsement from their math and science instructors, and permission of the Science Chair.*
 - This fast moving and very challenging course covers all the topics in Chemistry with an added emphasis on more complex and mathematically intense problem-solving techniques, independent learning, and detailed applications to contemporary science and technology. Topics will be explored in more depth and at a faster pace than in Chemistry, and students may explore additional topics in Thermodynamics, Electrochemistry, and/or Reaction Kinetics. Students should **expect** frequent and challenging out of class assignments for its entirety.

Biology

Fifth Form Biology is the last of the science requirements for graduation from The Haverford School. The course takes advantage of the experience students have acquired in their earlier physics and chemistry courses. Each student will gain a thorough knowledge of biological processes that apply to him and grow

to have an appreciation for the richness of the natural world around him. Emphasis will be placed on learning to make informed decisions about biological issues affecting the individual and the community.

Students will learn to think like a biologist by making careful, quantitative observations, asking good questions, forming testable hypotheses, designing and executing laboratory procedures, gathering, analyzing, and presenting laboratory data, developing scientific arguments, and coming to reasonable conclusions. Principle topics may include cell biology, biochemistry, classical and modern genetics, molecular biology, evolution, and animal and plant physiology.

- **Biology** - Biology at Haverford focuses on building a solid and thorough foundation of fundamental biological principles through a project-based curriculum. A high value is placed on students engaging in challenging activities, collaborating with peers, and reflecting on their experiences, all of which support the acquisition of disciplinary knowledge. In this context, more opportunities for scaffolding the student experience and differentiating learning are possible. Students are assessed both formatively and summatively on classroom participation and content application and mastery. **Prerequisite: Third Form Physics and Chemistry or permission of the Science Chair.**
- **Biology*** - *Prerequisite: An established record of dedication to fulfilling course requirements and a conscientious commitment to excel. Third Form Physics and a grade of A or better in Chemistry or successful completion of Honors Chemistry with the endorsement of the Chemistry instructor and permission of the Science Chair.*
 - **Biology*** at Haverford is a challenging and fast-paced course that covers more breadth of content, approximating an introductory college biology course. Students must be able to engage independently with the material, and should be comfortable using their textbook and other sources for the acquisition of knowledge. Students should execute laboratory exercises or projects confidently and independently, and are expected to incorporate these experiences into their overall understanding without prompting. Students are frequently assessed in a summative way, covering multiple textbook chapters at once, and focusing on content application and mastery.

Advanced Physics – A*

Pre and Co Requisites: An established record of dedication to fulfilling course requirements and a conscientious commitment to excel. Students must have completed Algebra II (with an A or better) or Algebra II (with B+ or better) and be enrolled in Pre-calculus or higher. Support of current math instructor and permission of the Science Department Chair are required for enrollment.*

This is an algebra-based physics course equivalent to a non-calculus introductory college-level course. It is designed to explore topics from Third Form physics as well as introduce additional topics from a conceptually deep and computationally intense perspective. Students will develop their understanding of physics through both lab inquiry and problem solving. The course will be conducted at an accelerated pace with a strong focus on problem solving and students should *expect* frequent and challenging assignments as well as intense collaborative project-based experiences. The first semester may stand alone but is required for enrollment in the second.

Semester 1 Topics: Mechanics (fall)

Kinematics; dynamics (Newton's Laws); circular motion and gravitation; energy; momentum; and torque and rotational motion.

Semester 2 Topics: Oscillations, Electricity and Magnetism (spring)

Oscillations; electrostatics, electrical circuits; magnetic fields; electromagnetism; physics and geometric optics; and, if time allows, basic concepts of special relativity and quantum physics. **Prerequisites: Completion of Semester 1 – Mechanics with a grade of B or better and support of the semester 1 instructor.**

Advanced Physics – C*

Prerequisite: An established record of dedication to fulfilling course requirements and a conscientious commitment to excel. Concurrent enrollment in Calculus I or a more advanced course in mathematics. Support of current math instructor and permission of the Science Department Chair are required for enrollment.*

This is a calculus-based physics course designed to explore topics from Third-Form physics while introducing additional topics common to a first-year college physics curriculum. All topics will be explored at an accelerated pace from a conceptually deep and computationally intense perspective that often relies on calculus. Students will need to be very proficient in algebra, trigonometry, and basic calculus. Students should *expect* frequent and challenging class assignments including group collaborations. The first semester may stand alone but is required for enrollment in the second.

Semester 1 Topics: Classical Physics (fall)

Linear and rotational mechanics, electricity and magnetism

Semester 2 Topics: Modern Physics (spring)

Thermodynamics, relativity, quantum physics, and health physics. **Prerequisites: Completion of Semester 1 – Classical Physics with a grade of B or better and support of the semester 1 instructor.**

Astronomy (*spring semester*)

The purpose of this course is to introduce the student to compelling aspects of astronomy that they may be less familiar with, namely to those areas of our universe that extend beyond our local solar system. We will investigate such areas as cosmology, galactic morphology, stellar evolution, dark matter and energy, evidence for intelligent life beyond our solar system, and the ultimate fate of the universe itself. We will be utilizing one of the more definitive classroom texts about astronomy, *Universe* by Freedman and Kaufmann. Our discussion will begin with a look at the origin and development of the universe and some of the largest-scale aspects of astronomy, effectively moving backwards through the book.

Electronics* (*fall and/or spring semester*)

Prerequisite: An established record of dedication to fulfilling course requirements and a conscientious commitment to excel. Completion of pre-Calculus with a grade of A- or better or pre-Calculus with a grade of B or better and a grade of B or better in Honors Chemistry or A- or better in Chemistry. Endorsement of the current science teacher and permission of the Science Chair. Co-requisite: Enrollment in a Calculus course or higher*

This course provides an introduction to electricity and electronics with a focus on hands-on experience and practical applications. Electronics is one of the fastest expanding fields in research. From the invention of the transistor almost seventy years ago to our current reliance on the “Information Superhighway,” electronics has been a vital part of our modern technological society. The semester will begin with a look at the evolution of electronics over the last century. This will be followed by a thorough examination of the basic principles: voltage, current, resistance, Ohm's Law, Kirchoff's Law, etc. After a significant amount of time is spent on identifying and understanding how various electronic components work, students will design their own circuits. Using a solder gun and solderless breadboards, students will learn how to build analog circuits that accomplish particular tasks. Later in the semester, students will also have an opportunity to work with integrated circuits. Teamwork, critical thinking, and problem solving will be important attributes. Assessment will be based on weekly lab projects, quizzes, homework, and a long-term circuit project.

Engineering* (*fall and/or spring semester*)

Prerequisite: An established record of dedication to fulfilling course requirements and a conscientious commitment to excel. Completion of pre-Calculus with a grade of A- or better and a grade of B or better in Honors Chemistry or A or better in Chemistry with endorsement of the current science teacher and permission of the Science Chair. Co-requisite: Enrollment in a Calculus course or higher.

Engineering* is a semester-long course designed for students who are seriously considering any engineering discipline as a college major. Students will be required to use first principles of physics, mathematics, chemistry, and biology to design, build, and test structures and devices. Prior to building, students will read and analyze the literature to understand state-of-the-art engineering solutions to

relevant problems and apply their developing knowledge of mechanics while preparing calculation-based designs. Students will then construct working prototypes to test their models, while gathering and analyzing data to inform the iterative process. The goal of each project will be to address an engineering problem relevant to practicing engineers while adhering to specific design and economic constraints. The accelerated pace of Engineering* will require students to complete calculations, modeling, and analysis independently. Topics will include energy transfer, fluid dynamics, biomechanics, materials chemistry, mechanics of materials, programming, systems integration and others as time permits. Students should *expect* frequent and challenging out of class assignments for its entirety.

Engineering: People and Processes (fall semester)

Prerequisite: Endorsement of the current science teacher and permission of the Science Chair.

Engineering is a discipline that makes the modern world tick. Students will learn what engineering is and the types of projects engineers work on. They will explore the practical process philosophies that a good engineer must use. Through a series of real world applications they will investigate the complexities of the decisions faced by engineers and develop the thought processes that guide engineers through these problems. Included in these are the trade-offs used to find optimum solutions, the design process, and the importance of failure. The students will complete team-based projects, where they must deliver a product against a series of specifications, on-time and to cost. Projects, which will vary year by year, will be based on utilizing mechanics of materials to design a device with a definable goal.

Engineering: Design, Build, and Test (spring semester)

Prerequisite: Endorsement of the current science teacher and permission of the Science Chair.

The class provides students with the opportunity to design, build and test projects in teams of two or three. The projects, which will vary year by year, will be based around a definable goal. In this environment the students will practice real world engineering in that they will be responsible for not only achievement of the end goals, but also for creating the detailed discrete steps that need to be taken to achieve those goals. The projects will always challenge the student to work in a collaborative environment where a drive to consensus is vital. Previous projects have included: designing and prototyping sports equipment, designing and manufacturing trebuchets to meet specific ballistic goals, and designing, programming, and assembling Sumo Wrestling Robots. The projects are rooted in the real world and through them the students will benefit from not only the hands-on engineering experience but also the development of life skills that are the hallmarks of good engineers.

Environmental Ethics and Policy (fall semester)

As young adults, it is of paramount importance that Haverford students understand some of the most pressing environmental challenges that confront their generation in the new millennium. Essential global issues such as water scarcity, peak oil, climate change, and much more will be explored. Local issues in the

state of Pennsylvania involving hydraulic fracking and environmental justice will also be discussed. We will take a holistic approach to confronting environmental challenges by not only discussing the scientific factors at play, but the social, moral, political, and economic factors as well. The course will be conducted like a discussion-driven graduate seminar where different points of view are encouraged. Course content will be borrowed from the University of Pennsylvania's graduate program in Environmental Studies. Students will be expected to read and interpret policy assessment reports and academic papers, constructively debate their peers, reach out to experts in the field, and collectively seek meaningful solutions.

Molecular Biology* (spring semester)

Prerequisite: Successful completion of Biology with a grade of B or better. The endorsement of the Biology instructor and permission of the Science Chair.*

This course is the synthesis of several disciplines: biochemistry, genetics, cell biology, and microbiology. Biologists have the means to analyze the Human Genome. The dissection of the molecular pathway through which hereditary information flows between DNA, RNA, and protein molecules adds to our understanding of human development and disease. Technological developments have provided powerful methods to isolate, analyze, and manipulate DNA, RNA and protein molecules. These developments have transformed biological and medical research. The majority of class time will be spent in the lab, learning and using molecular and cell biology research techniques to sequence a gene. Biotechnology will be provided to students, so they can learn theory, practice, and applications with hands-on experimental work. The curriculum may include applications of biotechnology such as genetic engineering, gene therapy, immunotherapy, and regenerative medicine.

Physiology*/Physiology

Physiology is a biological sciences course that focuses on the normal functions and components of living organisms, including humans. Course themes focus on the mechanisms that sustain life and the ways in which these normal processes can be disrupted. Students may elect to take two semesters of the course if they are eligible in order to complete a full year of the material; either semester may also be taken independently.

Physiology*- Communication and Recognition (fall)

Prerequisite: Completion of biology with a grade of B or better or completion of biology with the endorsement of the biology instructor and permission of the Science Chair.*

Topics include defenses against disease, transmission of information, regulation of body functions, and/or reproduction. Classroom learning takes advantage of laboratory exercises and dissections to provide opportunities to engage with the topics more deeply. Students must be able to engage independently with the material, and should be comfortable using multiple sources of information for the acquisition of knowledge. Student understanding is assessed by tests, laboratories, and projects.

Physiology - Structure and Transportation (*spring*)

Prerequisite: successful completion of biology with endorsement of the biology instructor or permission of the Science Chair.

Topics include body structures, animal locomotion, internal transportation of materials and/or reproduction. Classroom learning takes advantage of laboratory exercises and dissections to provide opportunities to engage with the topics more deeply. Students should be comfortable using multiple sources of information for the acquisition of knowledge. Student understanding is assessed by tests, laboratories, and projects.

Advanced Laboratory Research Cooperative I* (*spring semester Fifth Form*)

Prerequisite: Completion of Chemistry and Biology* with a grade of "A-" or better. Students will apply and be selected for this course by the science department during the fall semester of the Fifth Form year. Academic achievement, discipline record, attendance record, and input from past and current instructors will be considered during the application process. Formal invitations to enroll will be extended by the lead instructor or the Science Chair. Co-requisite: Students who receive credit for ALRC I* must enroll in ALRC II* in the Sixth Form.*

Boys will learn about several scientific fields via exploration as well as reading and discussion of selected current scientific research. Once they have identified a particular area of interest, the boys will begin investigating opportunities for placement in a cooperating local university or private laboratory. Boys who complete this independent study portion of the course may be asked, based on their performance, to commit to enrolling in ALRC II*. Following that invitation and commitment the boys will be enrolled in a eight to ten-week summer research experience in which they will work closely with investigators and/or graduate students at area universities, or private laboratories on research projects they have selected. Upon successful completion of the summer research portion of the course, boys will receive retroactive credit for ALRC I*.

Advanced Laboratory Research Cooperative II* (*fall semester Sixth Form*)

Prerequisite: Successful completion of ALRC I and permission of the ALRC I* instructor and the Science Chair.*

This is a one semester course for Sixth Form students who have completed ALRC I*. If necessary, students continue to gather and analyze experimental data based on their summer research work. Time is then devoted to the organization, analysis, evaluation, and interpretation of their data. Concurrently the boys will discuss each other's data in a presentation/seminar format. The boys will then formally write up their research for possible submission to competitions or publications and begin preparations for presentation of their research experience to the Haverford School Community. If time permits, students will explore possible research extension questions based on their original work. During the spring semester they will occasionally be asked to advise and interact with Fifth Formers currently enrolled in ALRC I*. Students will meet with the research advisor at least one long block each cycle. They will be expected to work independently between meetings. This course will be scheduled in addition to the students' regular five class load.

INDEPENDENT STUDY

This is an opportunity primarily reserved for Sixth Form students to pursue an academic interest in a tutorial setting. Independent Study is intended for work that is not available in the normal school curriculum. Independent Study can further the academic and intellectual interest of both students and faculty, enrich the curriculum, and encourage interdepartmental courses and cooperation. Be sure to include this in your planning for your academic course load when completing the Course Request Form in March. The Independent Study Committee, comprised of the Head of Upper School, the Director of College Counseling, and the appropriate Department Chair, will review each proposal. This course is available to students during the fall or spring semesters of the Sixth Form year or, in rare cases, the Fifth Form year. Students should see the Registrar for an Independent Study Proposal Form and due dates. A student, in conjunction with the appropriate teacher, will develop his independent study proposal that is then submitted to the Registrar and Independent Study Committee for review and approval.

INTERDISCIPLINARY STUDY

Global Perspectives with Travel to Cuba (*spring semester Fifth & Sixth Form*)

This four-unit course bridges interdisciplinary classroom learning with experiential and immersive travel, encouraging students to absorb and engage with new perspectives, foster independence and creativity, and inspire self-reflection. In the first unit, students will explore the foundations of citizenship in various societies, ancient and modern. The second unit will consist of projects relating to the United Nations' Sustainable Development Goals and will guide students to ponder the current state of our world through statistical models and scientific analysis. In the third unit of study, before the class' journey abroad to Cuba, the students will consider the country's current events, geopolitics, literature, culture and history through readings, class discussion and journaling. The course culminates with the opportunity for the student to delve into a significant research project of interest related to Cuba. The Director of Global Studies will lead the class and numerous faculty members will guest lecture on areas specific to their expertise. This semester elective includes travel to Cuba over Spring Break and it is strongly recommended that students who enroll in the course travel with the class.

There is an added cost to enroll in this course that will cover all travel expenses. That cost will be published when enrollment is finalized. See the Financial Assistance Policy for Global Studies Programs for more details.

CO-CURRICULAR ACTIVITIES

ATHLETICS

Each student must participate in two interscholastic sports or the equivalent thereof in Third, Fourth, and Fifth Forms and one interscholastic sport in the Sixth Form year.

Fall	Winter	Spring
Cross-Country	Basketball	Baseball
Football	Ice Hockey	Crew
Soccer	Winter Track	Lacrosse
Water Polo	Squash	Tennis
Crew	Swimming & Diving	Track & Field
Golf	Wrestling	Ultimate Frisbee
	Crew	

MUSIC AND THEATER

Glee Club – Please refer to Glee Club course description

Notables

This is the premier vocal ensemble at The Haverford School. An auditioned vocal ensemble, students sing a variety of a cappella music from around the world. Students refine the proper use of their voice, enabling them to sing music of great complexity and vocal range. The Notables perform music in a variety of musical styles, with emphasis placed on historical and stylistic performance practice techniques. Students sing in balanced voice parts, and sing music with up to eight parts. They sing in a number of languages, and memorize a substantial repertoire for performance. Additionally, elements of stage deportment, ambassadorship, and community service comprise a substantial part of ensemble study. The students rehearse extensively, and perform at school and in the larger community. The Notables are committed to providing community service through artistic performance. They perform numerous concerts each year, with the majority performed at hospitals, nursing homes, senior centers and the like. The ensemble frequently produces recordings. Students are evaluated on their level of artistry, coachability, memorization skills, and adherence to performance practices of the various styles in which they sing.

Orchestra – Please refer to Orchestra course description

Performance and Production Opportunities

Each year, The Haverford School Drama Department produces a minimum of two Upper School plays and/or musicals. By participating in theatrical productions either on the stage or back stage, students will become a vital part of a collaborative team. Students may count their participation in *one* of the

upper school productions as *one* of their sports requirements. Students may not count participation in both productions as a fulfillment of their sports requirements for the school year.

Stage Crew

As a member of stage crew, students have the opportunity to participate in the active creation of theatre. Working both on school productions and with professional organizations, students have hands-on experience with carpentry, lighting technology, and with scenic painting. To fulfill one sports requirement through this activity, students must complete one semester of stage crew participation. To fulfill both sports requirements, students need to participate in stage crew for the school year. However, all Haverford students must participate in the athletic program at least once before graduation.

The Haverford Advanced Chamber Ensembles

These are auditioned ensembles for advanced instrumental players. Students refine their musical skills by studying and performing literature from the standard chamber music repertoire. They focus on playing soloistically within a small ensemble while matching bow strokes, articulations, tone colors and interpretations. The ensembles meet one morning per week and perform throughout the school year.

The Haverford School Jazz Ensemble

This ensemble performs a variety of contemporary, jazz-influenced arrangements for winds, brass, and percussion section. Students are auditioned and must demonstrate a satisfactory skill level to participate, as determined by the director. Students learn the skills of performing in an ensemble. They hone their technical skills and play in a variety of jazz styles. More advanced students apply their skills and knowledge to the art of improvisation. Performance venues include school functions as well as evening concerts in the winter and spring. Students must inform their advisor and the Jazz Ensemble Director of their intent for this activity to count towards their Arts graduation requirement.

CLUBS

With more than 50 clubs and activities to choose from, our Upper School offers myriad opportunities for students to explore extracurricular activities and to develop leadership skills. All clubs are student-designed and student-led, with a faculty adviser who offers guidance and mentoring. Students and faculty are passionate about their interests – and they often extend their club commitments well beyond the boundaries of our schedule and campus.

All of our clubs and activities are active during the full School year. At the beginning of each academic year, students have the opportunity to join or start clubs based on their personal interests, and we enthusiastically encourage them to get involved. The list below is a representative, but not a comprehensive, sampling of clubs and activities that have been offered in the Upper School over the past several years. Clubs will be offered each year based on student interest.

SERVICE LEARNING

The Upper School Student Service Board at Haverford is very active, with a wide variety of activities and opportunities. These events are student driven and student run and all students are invited to participate. Students who are not on the Service Board are welcome to present ideas for projects at each of our twice-monthly meetings. Some examples of service projects are as follows:

City Year Servathon is a day where volunteers renovate community centers in Philadelphia.

Special Olympics invites students to support special needs kids with a weekend of sport activities and “competitions” at this annual event held at Villanova each November.

Riverbend Environmental Center’s Haunted Trails is an annual opportunity for students to help one of our environmental partners stage a fun evening of ghoulish activities for children and nature lovers.

Literacy Program supports Bryn Mawr Tutoring and goes to West Philadelphia to tutor young people.

Empty Bowls is our year-long hunger awareness education program, culminating with the Empty Bowls supper in April, which raises funds for our local hunger partners and advocates for those challenged by hunger and homelessness.

Helping Hunger Cooking Club meets several times throughout the year to prepare meals for 200 homeless people at Life Centers of Delaware County and Ronald McDonald House. Together with Agnes Irwin, students cook and later serve these meals.

Philadelphia Cares Day is a day of service involving urban renewal in the Philadelphia schools.

Environmental Work Days Throughout the year we partner with local organizations to support and promote environmental projects including: clearing bike and walking trails, cleaning up streambeds, prepping playgrounds for physically disabled, helping plant and harvest at our local CSAs, etc. in Radnor, Haverford and Lower Merion

To raise awareness and funds, boys participate along with students from Agnes Irwin and Baldwin in various walks such as: **AIDS Walk Philly, Juvenile Diabetes Walk, American Heart Walk, Out of the Darkness Suicide Awareness Walk, The Buddy Walk** to support kids with Down Syndrome, **Walk to Cure MS**, and several others throughout the year.

In the spring, we participate in **Race for the Cure for Breast Cancer** and the **Home Run Baseball Derby** to raise funds for **Prostate Cancer Research**. Our Lacrosse team runs the annual **Checking for Cancer Tournament** to support male cancer research.

Students also have the opportunity to lead campaigns to support those in need such as Hunger Relief, the elderly, the homeless, and a variety of other crisis situations as they occur.

SERVICE LEARNING IN THE CLASSROOM

Whenever possible, we seek to integrate service opportunities into the classroom and curriculum to offer students real-life context to what it is they are learning. Examples might be: students in American History class will run a voter registration project for our own students; Ceramics students build bowls to be painted and sold at our Empty Bowls Supper; Engineering students design a water collection and irrigation system to help make the Learning Garden sustainable and environmentally responsible; Spanish classes tutoring immigrant workers in our region.

These efforts put their education and knowledge into action, and are offered to students throughout all divisions at The Haverford School.

QUESTIONS

If you have any questions about the contents of this Course Catalog, please contact:

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