

# TECHNOLOGY

Gilman seniors may elect to take various computer courses. Many classes in the Upper School curriculum incorporate computer technology as an integral part of the course. Please note that there are several attractive GOA options available in Computer Science for both juniors and seniors.

Departmental approval (Mr. Campbell) is required for enrollment in an Advanced Placement course.

## 11TH GRADE COURSE ELECTIVES – YEAR

### A.P. COMPUTER SCIENCE (BMS)

A.P. Computer Science A (Java) -- This yearlong course in computer science introduces students to computers and computer programming methodology, fundamental data structures, decision structures, and compound statements. Students develop skills to design and implement computer-based solutions to complex problems and abstract dilemmas. A programming background is helpful but not necessary. Students must have consent from the Computer Science department. Students take the A.P. Computer Science exam in May. Macintosh computers are used.

## 12TH GRADE COURSE ELECTIVES – YEAR

### ADVANCED TOPICS IN COMPUTER SCIENCE (HONORS) (BMS)

This course examines implementing data structures and algorithms for efficiently organizing and manipulating large amounts of data. Classic data structures such as sets, linked lists, queues, stacks, trees, graphs, and hash tables will be examined. Runtime efficiency of these structures will be compared using big-oh notation. Students will also develop a deeper understanding of software engineering principles and will learn how to design larger programming projects. Prerequisite: Successful completion of AP Computer Science A.

### A.P. COMPUTER SCIENCE (BMS)

Please see the description above.

### A.P. COMPUTER SCIENCE (RPGS)

A.P. Computer Science A is a problem-solving and programming-focused course using Java as the specific coding language. This year long course in computer science introduces students to computer programming methodology, fundamental data structures, program flow, and basic object-oriented data organization and management. Students develop problem-solving skills through application design, debugging, and altering code from existing applications. Prior computer programming background is strongly encouraged. Students take the A.P. Computer Science exam in May. This on-line course is not open to juniors.

### A.P. COMPUTER SCIENCE PRINCIPLES (RPGS)

Computer Science Principles is a new College Board Advanced Placement course that is designed to introduce students to the central ideas and practices of computational thinking, and show how computing changes the world. Students will have the opportunity to use programming, computational thinking, and data analytics to create digital artifacts and documents representing design and analysis in areas including the structure of the Internet and how it works; algorithms; and the impact that these have on science, business, and society. Students are taught how to use computational tools and techniques including abstraction, modeling, and simulation to collaborate in solving problems that connect computation to their lives. The course is rigorous and rich in computational content, includes critical thinking skills, and engages students in the creative aspects of the field. This course emphasizes themes that help students build a solid understanding and facility with computing and computational thinking — knowledge that is important, if not integral, to being part of a well-educated and informed citizenry. Students take the A.P. Computer Science Principles exam in May. This course is suitable for students who have completed Algebra.

## STATISTICS AND DATA SCIENCE (BMS)

Please see the description in the Mathematics section.

## 12TH GRADE COURSE ELECTIVES – FIRST SEMESTER

### GRAPHIC DESIGN Semester I (BMS)

This semester course teaches students the basics of graphic design, including visual cohesiveness, layout, and color usage. Students will use these design concepts to create projects using the software applications Adobe Photoshop, Illustrator, and InDesign. Over the course of the semester, students will develop a portfolio of pieces ranging from a book cover to a logo design to a magazine. This course will also cover basic advertising principles and teach students how to analyze print design. No previous art or computer knowledge is required.

### INDUSTRIAL DESIGN Semester I (BMS)

This project-based course will challenge students to develop innovative solutions to problems using technology. The steps in the design thinking process: research, ideate, develop, prototype, refine, and build will be central to the workflow of the class. Students will explore topics including programming, 3-D printing, and electronics in a self-directed manner and will produce a project of their own design to be presented at a Maker Faire. They will contribute to the Maker community by documenting their progress and collaborating with other makers when appropriate.

### MATLAB Semester I (RPCS)

MATLAB is a technical programming language and development environment currently adopted by more than 5,000 universities around the world and widely used in industry. MATLAB allows students to perform numeric computations, develop algorithms, and create their own data visualizations, enhancing their proficiency in problem analysis, problem solving, and solution design. Students interested in majoring in science, math, economics, and engineering fields in college should consider learning MATLAB now to help ease the freshman year transition. In this course, we will create scripts, programs, models, and simulations to accelerate students' mastery of MATLAB. Potential projects include: image

processing, computer graphics, animation, data analysis, economics applications, sound file manipulation, scientific computations, and robotics. No prior computer programming experience is required. Former A.P. Computer Science or A.P. Computer Science Principles students, however, are also welcome. Software Required: MATLAB and Simulink Student Version; instructions for how to purchase will be provided.

### PROGRAMMING iPhone APPLICATIONS (HONORS) Semester I (BMS)

This semester course will give students a foundation for programming apps on iOS devices: iPhone, iPod Touch, and the iPad. While this accelerated, honors course, assumes no background in computer programming, the course will move quickly to cover a wide range of areas relating to app development. Through the use of Xcode, Photoshop, and other Mac software tools, students will learn a wide range of programming techniques, the foundations of Object Oriented Programming, and design strategies for aesthetically pleasing apps. This course does NOT require the students to have an iPhone, iPod Touch, or an iPad.

## 12TH GRADE COURSE ELECTIVES – SECOND SEMESTER

### ROBOTICS Semester II (BMS)

The Robotics course is designed to explore the past, current and future use of automation technology in industry and everyday use. While using the design process, students will learn to program their robots, build prototypes, and use simulation software to test their designs all while documenting their work in their design journal. The class culminates with an in-class robotics competition that is focused around a specific challenge.