

# Computer Science & Robotics

## Requirements:

One-half credit course in grades 9-12

## Courses Offered in 2020-21

Half credit courses

- Programming in Python (CMPR 210)
- Programming in Java (CMPR 211)
- Introduction to Engineering and Robotics (CMPR 215)
- Mobile Apps (CMPR 310)
- Computer Science 2 (CMPR 315)
- Software Engineering (CMPR 411S)

Full credit courses

- AP Computer Science A (CMPR 401)
- Art of Data (CMPR 410)

## Computer Science & Robotics

At a time when technology in the modern world is rapidly evolving, the curriculum in the Department of Computer Science & Robotics fosters the technical proficiency that will enable our students to use and produce applications effectively. To this purpose, the sequence of courses is continuously adapted in accordance with current advances in technology. The primary focus of the curriculum remains the development of skills and habits of thought that will enable our students to put forth theory and application in an effective, precise, and ethical manner. Students will be able to experience an introduction to the intellectual enterprises of computer science and the art of programming.

The Department of Computer Science & Robotics offers a range of introductory and advanced opportunities in the field of computer technology. These courses cover topics including web design, programming, robotics and engineering.

### **Requirements:**

One-half credit course in grades nine through twelve.

### **200-level courses:**

#### **CMPR 210 - Programming in Python**

*One-half credit, meets every other day*

*Prerequisites: None*

In this introductory-level course, students will create computational artifacts using the programming language of Python. An artifact might be creating a computer program, designing a website or prototyping a new gadget. The student becomes the producer by studying the insides of the computer from hardware to software. Students will explore how they interact with technology including both the physical buttons and icons they press and the societal and ethical implications of their actions. The fundamentals of Computer Science takes you beyond being just a user of technology. Topics will include exposure to programming principles, data representation, and engineering tasks through physical computing. This course is appropriate for students who have no previous programming experience.

#### **CMPR 211 - Programming in Java**

*One-half credit, meets every other day*

*Prerequisites: Prior programming experience, departmental approval.* In this introductory-level course, students will create computational

artifacts using the programming language of Java. An artifact might be creating a computer program, designing a website or prototyping a new gadget. The student becomes the producer by studying the insides of the computer from hardware to software. Students will explore how they interact with technology including both the physical buttons and icons they press and the societal and ethical implications of their actions. The fundamentals of Computer Science takes you beyond being just a user of technology. Topics will include exposure to programming principles, data representation, and engineering tasks through physical computing. .

**CMPR 215 - Introduction to Engineering and Robotics**

*One-half credit, meets every other day*

*Prerequisites: Departmental approval for 9th graders.*

This course encourages creativity and celebrates ingenious solutions to engineering and mechanical problems through design and construction of purpose-built computer devices and robots. Students in this course will utilize the facilities of our Robotics Innovations Lab, where they will learn to apply research design, construction, programming, and electronics.

This course would be an appropriate entry point for a ninth grader interested in joining the robotics team. The team participates in regional and national competitions such as F.I.R.S.T. (For Inspiration and Recognition of Science and Technology).

**300-level courses:**

**CMPR 310 - Mobile App Development**

*One-half credit, meets every other day*

*Prerequisites: Introductory level Computer Science course.*

The Mobile App Development course will give students practical experience with the tools, techniques, and concepts needed to build basic mobile apps from the ground up. This is a project-based course that will allow students to further explore programming fundamentals.

**CMPR 315 - Computer Science 2**

*One-half credit, meets every other day*

*Prerequisites: Introductory level Computer Science course.*

What is a computer? How is computer science useful? In CS2, not only will students learn the basics of computer programming, they will also get a better sense of where computer science can fit into their lives. Students will read articles about computer science trends and use computer science to problem-solve issues they've come across. They will learn how to write Java programs from scratch, in addition

to using the Greenfoot library. Topics include using the terminal, object-oriented programming, boolean algebra, control structures, and human-centered design.

**400-level courses:**

**CMPR 401 - AP Computer Science A**

*Open to seniors only in 2020-21*

*Full credit, meets 5 days/week*

*Prerequisites: Computer Science 2 and departmental approval.*

AP Computer Science prepares students for the College Board Computer Science A exam, and in addition teaches content consistent with most college and university courses. The course focuses on more complex studies of algorithms and data structures including linked lists, sets, maps, queues, stacks, trees, and hash tables. Seminar topics are discussed and debated on current issues of Big Data and Computer Ethics. The course is taught using the Java programming language. Students are required to take the AP exam at the end of the year.

**CMPR 410 - Art of Data**

*Full credit, meets 4 days/week*

*Prerequisites: B+ or higher in Computer Science 2 and departmental approval.*

The Art of Data course is designed to provide students with a Computer Science lens to think about data. Students will be better equipped to approach, investigate, and present their findings of datasets. This course focuses on how code can be used to analyze data, with an emphasis on the artistic and interpretative aspects of this process. It is not enough to look only at the numbers; it is crucial that students also gain an appreciation of the intricacies of the domains that datasets can come from. Students will finish the course with a comprehensive portfolio of resources and projects that they can present and refer back to.

**CMPR 411S - Software Engineering**

*One-half credit, meets every other day*

*Prerequisites: A grade of B+ or higher in a full credit Computer Science course, department approval.*

The Software Engineering course will immerse students in the process of creating software and highlight how the field is one that walks a fine line between the creative and scientific. Students will engage in the study of building, designing, developing, maintaining and retiring software. In addition, students will learn how to visualize a product, explain their design to those with far less technical skill, and then work as a team to create the requested product. Students will engage in a year-long project, whose field of study will vary from year to year.

**COURSES NOT OFFERED IN 2020-21**

**CMPR 412S - Computer Science and Engineering Seminar**

**[Course not offered 2020-2021]**

*Full credit, meets 4 days/week*

*Prerequisites: A- or higher in a full credit Computer Science course and departmental approval.*

*A or higher in the Intro to Engineering course and departmental approval for the 2020-2021 school year for students interested in Engineering studies.*

The Computer Science and Engineering Seminar course is designed to provide students with the opportunity to engage with complex topics and apply them in practical applications. This course will emphasize the importance of the collaboration and combination of both the software and hardware components of any technological project. Students, no matter their interest, will complete the course with respect for both Computer Science and Engineering, and a stronger understanding of how both work together to advance technology. The Computer Science topics and the Engineering topics will vary from year to year.