



# SMH Robotics and Computer Science Programs

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## Middle School

**INTRODUCTION TO ROBOTICS** Form 6 Length of course: 1 semester Texts: None Software: Lego Mindstorms Education EV3 Prerequisites: None Course Description: Introduction to Robotics offers students a balanced exposure and practice in both mechanical engineering and computer programming. During this course, students will be challenged to broaden their understanding on how mechanical parts move independently and jointly, as well as on the essential concepts and principles of computer programming concepts. Engineering and programming expectations and complexity will vary with the skill of the students. Throughout the semester long-course, students will be broadening their knowledge of robot-building through building challenges designed to enable the students to master the art of building. This course is task-based and will be modified on an individual basis to challenge the student based on his/her level of proficiency in the area of robotics.

**ADVANCED ROBOTICS** Form 8 Length of course: 2 semesters Texts: None Prerequisites: Permission of instructor. Course Description: Advanced Robotics is intended as a continuation of Introduction to Robotics; however, participation in the introductory class, though encouraged, is not required. The advanced course is year-long with multiple emphases on engineering design and construction as well as computer programming. The class will utilize For Inspiration and Recognition of Science and Technology (FIRST) Tech Challenge program as the main project and frame of study. Participation in the competition is highly encouraged. The robot will be designed and built with TETRIX robotic kits and some customized parts via 3D modeling and printing. Students are expected to develop a clear understanding of engineering process during this course. Additionally, a mastery of graphical programming is expected as the year and the building platforms progress. Some new and/or more difficult areas of programming, such as object oriented programming via Java, will be introduced as opportunities arise.

## Upper School

**BASIC STEM (Science, Technology, Engineering, and Mathematics)** Length of Course: 1 semester (fall) Major Obligations of Coursework: This course is performance-based so willingness to work and participation in class are the bases for all assessment. Students will be expected to complete one task related to the class each week. Course Description: This course is designed as a hands-on supplemental course to support those students who have either experienced difficulty with concepts in mathematics and physics in previous years at SMH or who are new to SMH and have not achieved the commensurate level of background experience in math and physics found at SMH. The course will utilize a variety of techniques in a hands-on performance-based environment to support basic concepts covered in Physics I and Algebra I.

**INTRODUCTION TO COMPUTER SCIENCE** Length of Course: 1 semester (spring) Prerequisites: Completion of Algebra Course Text: none Course Description: The Introduction to Computer Science Course is for those students who wish to satisfy their curiosity about the diverse world of Computer Science but who have done little to no programming on their own in the past. Students will learn the basics of programming including basic web design, app building, and robotics programming beginning with "drag and drop"



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graphical-based programming “languages” and ending with true syntax-based coding languages. Additionally, students will learn the basics of “making” including platforms such as Arduino and Raspberry Pi, and learn how to create electronics projects integrating their respective hardware with basic programming. Students will leave the class having created a variety of software and hardware projects, having learned some coding basics, and having gained a new appreciation for, knowledge about, and understanding for the world of Computer Science.

**ADVANCED PLACEMENT COMPUTER SCIENCE A** Length of Course: 2 semesters Prerequisites: Completion of Algebra II; teacher recommendation Requirement for Continuation into Spring Semester: Minimum C average at semester Major Obligations of Coursework: Various programming assignments in addition to standard homework, quizzes, and tests; all programs undergo rigorous design, implementation, and testing. A computer at home is helpful, but not required, as it is possible to complete all programming assignments at school. 31 Course Description: The College Board’s AP syllabus provides the framework for this course. In addition to the AP course outline, students will be assigned advanced projects and will be required to take the AP Computer Science Level A Examination. Major emphasis is placed on structured design and implementation of solutions to problems by application of the concepts of modularity, abstraction, and data structures.

**BIOENGINEERING** Length of Course: 1 semester Prerequisites: Upper school physics and instructor approval Text: None Course Description: Bioengineering is the hands-on, project-based learning that is the essence of engineering. Students work together to answer questions and solve problems, and as they do so they collaborate, think critically and creatively, and communicate with one another. They also make decisions based on objective measures and data and learn to fail and then recover from failure by using a systematic approach.