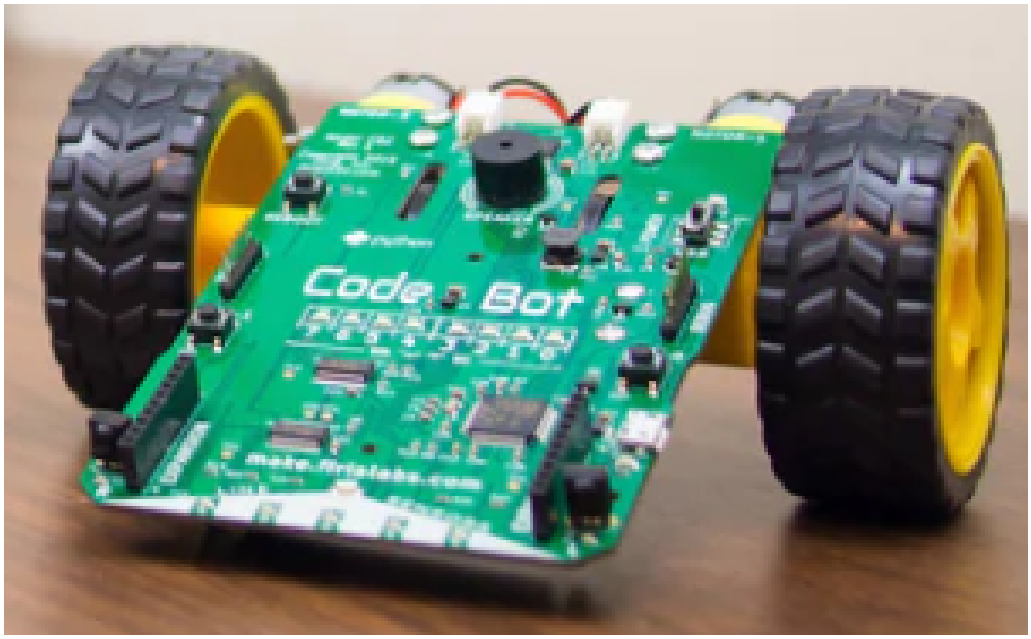
Python with Robotics (CodeBot)
TEKS Technology Applications Grade 7 Curriculum

The curriculum for Technology Applications Grade 7 consists of programming CodeBot projects and completing lessons in computer science topics. CodeBot is an educational robot built for learning Python programming. This ‘bot puts the focus on coding, with built-in sensors and programmable controls for endless projects and learning opportunities. Using a physical device for coding dramatically increases engagement and interest over traditional computer science instructional methods that focus on math problems or manipulating on-screen elements.

Our educational program creates real-world learning experiences for students. This is achieved through the use of:

- Open-ended physical hardware, used to implement meaningful projects
- Step by step guided lessons in CodeSpace
- Open-ended software, integrating development tools with instructional content, with the possibility of students to directly apply the tools well beyond the scope of what is covered in the curriculum
- Programmable built-in sensors, accelerometer, and speakers
- LEDs for status display of all systems, and console log for printing
- Python, the fastest growing major programming language used in Industry



All standards are met by completing the required projects. The amount of time needed to complete the curriculum is flexible. It is recommended that students spend at least 30-45 per class period.

- The CodeBot projects should be completed in order.
- The additional projects can be completed in any order.
- Optional coding projects are available as time permits, but are not required to meet the standards.

Teachers have the option of completing the coding projects and then the additional project units, or intermixing coding with additional computer science content.

Some possible timelines are suggested below. These are not the only options, but show the flexibility of the curriculum to meet the needs of the teacher and class.

Option 1 -- coding followed by additional topics

0	Overview
1	Project 1: First Steps
2	Project 2: Time and Motion
3	Remix 2
4	Project 3: Animatronics
5	Remix 3
6	Project 4: Fence Patrol
7	Remix 4
8	Project 5: Line Follower
9	Remix 5
10	Project 6: Hot Pursuit
11	Remix 6
12	Additional Topic: Technology
13	Additional Topic: Digital Citizenship
14	Additional Topic: Computer Science
15	Additional Topic: Web Pages
16	Final Project

Option 2 --coding intermixed with additional topics

0	Overview
1	Project 1: First Steps
2	Project 2: Time and Motion
3	Remix 2
4	Additional Topic: Technology
5	Project 3: Animatronics
6	Remix 3
7	Project 4: Fence Patrol
8	Remix 4
9	Additional Topic: Digital Citizenship
10	Project 5: Line Follower
11	Remix 5
12	Project 6: Hot Pursuit
13	Remix 6
14	Additional Topic: Computer Science
15	Additional Topic: Web Pages
16	Final Project

Python with Robotics (CodeBot)
TEKS Technology Applications Grade 7 Curriculum Crosswalk

Beginning of Course

Lesson/Mission	Outline of lesson	Standards
Typing *(approx. 30 min)*	This is the start of the Data & Trends lesson. Students are introduced to a typing program and start typing practice for about 10 minutes 2-3 times a week. Students keep track of their words per minute on a table that they will use later on to create a chart and make inferences. Final Project: in the Data and Trends lesson	(12) D
(Optional) Pre-Coding Assignment	The assignment allows for time to get to know your students, assess their prior knowledge, and build a foundation of computer science basics. During this project you can guide your students to building a foundation of computational thinking. Dedicate some time for students to learn basic terms, such as algorithm, program and debug. You can also engage students in unplugged activities.	(1) C, E (2) A (4) C

Course Coding Projects

Coding Project	Outline of lesson	Standards
Project 1 *2-3 class periods*	**First Steps** The project gives students a tour of the coding editor CodeSpace and shows how to navigate the lesson panel, project menu, tool box, etc. It discusses input and output, hardware and peripherals. Students explore the CodeBot and learn where to find the buttons, sensors, motors, etc. They attach the CodeBot to their laptop/computer with a USB and write their first program. Students are taught to use descriptive file names and save their file using proper file management.	(7) A (11) A (12) C, E
Project 2 *5 class periods*	**Time and Motion** The project introduces editor short-cuts and the debugger. Students learn about binary numbers and use the concept to turn on LEDs. Students are encouraged to make their code readable by using comments and white space. Students use literal values and variables in their code. The concepts of sequential and selection are introduced. Students turn on the motors and make the robot move in a specific pattern. Finally, they use a button as input.	(1) E (2) A (3) A (4) C (5) A (7) A (11) A (12) C, E

Remix Project 2 *5 class periods*	**Time and Motion Remix** For this project students will use what they have learned from project 2 to create their own original program. Suggestions for a remix are included at the end of project 2, or students can be creative and come up with their own ideas. Another suggestion is for students to work in teams and work on employability skills, like time management, leadership, planning, and communication. Students should seek feedback during their remix, and present their project in a variety of ways such as print, monitor display, web pages, or video.	(1) A, E (2) A (3) A (4) C (5) A (7) A (11) A (12) C, E, H
Project 3 *5 class periods*	**Animatronics** The project gives students a real-world application for their robot. Students help develop an algorithm for their application. Students use a counter, the assignment operator, comparison operators, and nested if statements. Iteration is introduced with while loops. The speaker is used to make the robot "speak" and the robot is programmed to move in a specific pattern. The final result is a robot that could be used as a greeter at a theme park.	(1) E, F (2) A, B (3) A (4) C (5) A (7) A (11) A (12) A, C, E, F, H
Remix Project 3 *5 class periods*	**Animatronics Remix** For this project students will use what they have learned from project 2 and project 3 to create their own original program. Suggestions for a remix are included at the end of project 3, or students can be creative and come up with their own ideas. Another suggestion is for students to work in teams and work on employability skills, like time management, leadership, planning, and communication. Students should seek feedback during their remix, and present their project in a variety of ways such as print, monitor display, web pages, or video.	(1) A, E, F (2) A, B (3) A, B (4) C (5) A (6) A (7) A (11) A (12) A, C, E, F, H
Project 4 *5-7 class periods*	**Fence Patrol** The final project will enable the robot to stay within a "fence" or border. Students will learn about line sensors and their LEDs. Analog and digital data is discussed. Students learn about strings and formatting output in the console log. Students will use abstraction by writing their own functions. Parameters and arguments are reviewed. Students complete worksheets that track data for distance and type of surface.	(1) E, F (2) A, B (3) A (4) C (5) A (6) A (7) A (11) A (12) A, C, E, F, H
Remix Project 4 *5-7 class periods*	**Fence Patrol Remix** For this project students will use what they have learned from projects 2-4 to create their own original program. Suggestions for a remix are included at the end of project 4, or students can be creative and come up with their own ideas. Another suggestion is for students to work in teams and work on employability skills, like time management, leadership, planning, and communication. Students should seek feedback during their remix, and present their project in a variety of ways such as print, monitor display, web pages, or video.	(1) A, B, D, E, F (2) A, B (3) A, B (4) C (5) A (6) A (7) A (11) A (12) A, C, E, F, H
Project 5 *5-7 class periods*	**Line Follower** In this project, students continue to learn about and program the robot's sensors. The list data type is introduced and used. Selection with more than	(1) C, E, F (2) A, B (3) A

	two branches is used in the code. Students create several functions, one of which is a "wait" function that uses a button as input. Global and local variables are discussed. Sequence, selection and iteration are used in the program. Students complete worksheets that track data and for reflection.	(4) C (6) A (7) A (11) A (12) A, C, E, F, H
Remix Project 5 *5-7 class periods*	**Line Follower Remix** For this project students will use what they have learned from projects 2-5 to create their own original program. Suggestions for a remix are included at the end of project 5, or students can be creative and come up with their own ideas. Another suggestion is for students to work in teams and work on employability skills, like time management, leadership, planning, and communication. Students should seek feedback during their remix, and present their project in a variety of ways such as print, monitor display, web pages, or video.	(1) A, B, C, D, E, F (2) A, B (3) A, B (4) C (6) A (7) A (11) A (12) A, C, E, F, H
Project 6 *5-7 class periods*	**Hot Pursuit** In this project, students learn about proximity sensors and their LEDs. Students must use math and math functions to convert data from the sensors into usable information. They format string and data output in the console log. Abstraction is reinforced by creating a function that can be used for several sensors. Students learn about calibration and use a function with a button press to calibrate the robot while the code is running. Students complete worksheets that track data for the sensors, power, and sensitivity, as well as a reflection.	(1) C, E, F (2) A, B (3) A (4) C (6) A (7) A (11) A (12) A, C, E, F, H
Remix Project 6 *5-7 class periods*	**Hot Pursuit Remix** For this project students will use what they have learned from projects 2-6 to create their own original program. Suggestions for a remix are included at the end of project 6, or students can be creative and come up with their own ideas. Another suggestion is for students to work in teams and work on employability skills, like time management, leadership, planning, and communication. Students should seek feedback during their remix, and present their project in a variety of ways such as print, monitor display, web pages, or video.	(1) A, B, C, D, E, F (2) A, B (3) A, B (4) C (6) A (7) A (11) A (12) A, C, E, F, H

Additional Lessons

Lesson/Mission	Outline of lesson	Standards
What is computer science? *(approx. 90-120 min)*	The lesson is ideal for either the beginning or end of the course. Students will watch videos of careers that use computer science. They learn to envision themselves as being computer scientists. Final Project: Create a digital artifact on computer science • Could be on computer science in general or a specific topic • Could be on a career in computer science • Digital artifact ideas: Web page, poster, slide show, booklet, in-person presentation	(4) A, B (7) A (12) H

Technology & Global Trends *(approx. 90-120 min)*	The lesson discusses changes in technology throughout history. Students will discuss global trends, and predict where the future of technology will go. Final Project: Create a digital artifact on a global trend (Poster)	(4) A, B (7) A (11) A (12) A, C, F, H
Data & Trends *(approx. 90-120 min)*	This lesson culminates the typing practice with a graph and chart. At the beginning of the course, students started a typing program and practiced typing 2-3 times a week, recording their words per minute. Students will graph by hand their typing progress on a paper. Then recreate their graph using digital software, such as Google Sheets or Excel. Possible warm-up or extension activities for this lesson: • Poll the students on a topic (age, birth month, favorite dessert, etc.) • As a class, create a graph and make inferences/look for trends • Look at graphs and analyze patterns and sequences • Analyze patterns (compare with other students' charts) and sequences Possible extension: Complete this lesson during the middle of the course and make inferences based on the graph. Then continue typing 2-3 times a week and recording data. Revisit the graph and see how close the predictions are. Final project: Create a graph of typing speed	(4) C (6) A (7) A (11) A (12) A, C, D, F, H
The Design Process *(approx. 90-120 min)*	This lesson will explain the design process for software development. The use of flowcharts and pseudocode will be introduced and practiced. The lesson will also look at how the design process is used in various industries. Students will discuss goal setting and personal character traits needed to resolve design challenges. After this lesson, students are expected to create a flowchart or pseudocode for their programs. Final Project: Choose one of the following • Quiz on interpreting and creating flowcharts, design process • Poster or slide show presentation	(1) A, B, D, F (2) B (3) A, B, C
File Formats & Management *(approx. 45-75 min)*	The lesson will discuss various file formats of digital information, such as text, graphics, video and audio. Then file management strategies will be taught, such as file naming conventions, local and remote locations, backups, folder structure and file conversions. Emerging digital organizational strategies will be discussed. Students will learn about data storage choices, such as on a server, in the cloud, or using a flash drive. Final project: choose one of the following: • No final project -- students demonstrate file formats and management strategies throughout the course • Quiz on vocab, strategies and data storage options • Poster or slide show or presentation	(11) A (12) A, B, G
Google Searches	The lesson will have students practice looking for information using a search engine. Students will start with looking at trends based on searches. Then students will use simple searches and get progressively more specific by	(5) A, B (6) A (7) A

(approx. 45-75 min)	using keywords, Boolean operators and limiters. Students are required to search for a variety of digital data, including text, images, and audio or video files. Final project: Complete a search engine scavenger hunt (timed or untimed)	
Digital information *(approx. 30-60 min)*	The lesson will show students, at a basic level, how data can be represented in binary. Different data types will be discussed, such as integers, strings, Boolean, real numbers and lists, so that students can select the best data type to represent information. Final Project: Demonstration of learning. Could be any of the following ● Binary game for practice ● Kahoot or quiz on binary and data types ● Completion of a worksheet ● Poster or slide show presentation	(2) A (5) A
Digital Citizenship *(approx. 45-120 min)*	The lesson will show students different styles of digital communication. They will learn that their online actions can have a long term effect. Students will practice digital etiquette and learn how to use digital communication responsibly. Final project: create an artifact to present on this topic ● Suggestion: slide show or poster ● Include peer feedback	(7) A (8) A, B, C (9) A (11) A (12) A, C, H
Cybersecurity *(approx. 45-120 min)*	During this lesson students will learn about real-world cybersecurity problems, such as phishing, malware, and hacking. They practice safe, legal and ethical digital behaviors so they are responsible digital citizens. The impact of cyberbullying will also be discussed. Final project: create an artifact to present on this topic ● Suggestion: slide show or poster ● Include peer feedback Final project: Program the CodeX to be password protected ● Press the buttons in a specific order to “unlock” the CodeX) ● Peripherals are not required for this project, but they can be incorporated	(4) B (7) A (9) A (10) A, B (11) A (12) A, C, H
Intellectual Property *(approx. 45*90 min)*	The lesson defines intellectual property and covers intellectual property laws. Students learn about copyright law, fair use, creative commons, open source and public domain. Students learn how to cite their sources for a variety of digital forms of intellectual property. Final project: create an artifact to present on this topic ● Suggestion: report	(7) A (9) B, C, D (11) A (12) A, C, H

Optional Coding Projects

Project	Outline of lesson	Standards
Project 7 *7-10 class periods*	**Navigation** In this project students learn about the robot's encoders, which lets them code the robot for a specific speed regardless of surface or battery power. The program involves a lot of math and many functions. Global and local variables are reviewed, as well as parameters and arguments. Students learn a lot more about lists and ways to use and copy them.	(1) C, E, F (2) A, B (3) A, B (4) C (6) A (7) A (11) A (12) A, C, E, F, H
Remix Project 7 *7-10 class periods*	**Navigation Remix** For this project students will use what they have learned from projects 2-7 to create their own original program. Suggestions for a remix are included at the end of project 7, or students can be creative and come up with their own ideas. Another suggestion is for students to work in teams and work on employability skills, like time management, leadership, planning, and communication. Students should seek feedback during their remix, and present their project in a variety of ways.	(1) A, B, C, D, E, F (2) A, B (3) A, B (4) C (6) A (7) A (11) A (12) A, C, E, F, H
Project 8 *5 class periods*	**All Systems Go** In this project, students learn how to check the battery power and temperature of a robot. They learn how to append a value to a list and use the list to find a total and average. The accelerometer is used for readings in all three directions. The final program has the robot acting like a guard-bot that can detect motion.	(1) C, E, F (2) A, B (3) A, B (4) C (6) A (7) A (11) A (12) A, C, E, F, H
Remix Project 8 *5 class periods*	**All Systems Go Remix** For this project students will use what they have learned from projects 2-8 to create their own original program. Suggestions for a remix are included at the end of project 8, or students can be creative and come up with their own ideas. Another suggestion is for students to work in teams and work on employability skills, like time management, leadership, planning, and communication. Students should seek feedback during their remix, and present their project in a variety of ways such as print, monitor display, web pages, or video.	(1) A, B, C, D, E, F (2) A, B (3) A, B (4) C (6) A (7) A (11) A (12) A, C, E, F, H
Project 9 *7-10 class periods*	**Obstacle Course** This extension project will have the robot to complete an obstacle course. Students will use proximity sensors to avoid obstacles and navigation code to navigate the course. Students will create their own custom library of functions to use in their program. Extra features can be programmed, like using the	(1) C, E, F (2) A, B (3) A, B (4) C (6) A

	LEDs, making beeps, and a win or lose feature.	(7) A (11) A (12) A, C, E, F, H
Project 10 *7-10 class periods*	**Multitasking** The extension project uses event-driven commands. Students create a callback function to react to events such as timeouts and sensor changes. Functions are written that enable the robot to multitask when an event happens,	(1) C, D, E, F (2) A, B (3) A, B (4) C (6) A (7) A (11) A (12) A, C, E, F, H