

# VEX EDR V5

**VEXcode Pro Robotics Course  
(C++)**

# Getting Started with VEX V5



- This course provides a structured sequence of project-based lessons and activities.
- The lessons and activities are designed to help you grow as a Computational Thinker and a Robotician.
- We'll install the software, learn about the hardware and configure the robot.
- During the course we'll go through all the fundamental programming concepts of C++ (Of course these concepts are not exclusive to C++)
- We'll end this course with a final project where you will have to apply everything you learned in order to successfully complete the project.

# System Overview

The VEX EDR V5 is a robotics kit that is ideal for robotics education and competitions. The system contains several key electrical components, such as the Robot Brain, Smart Motors, Wireless Controller, Robot Radio, and Robot Battery. Familiarity with these components, as well as how they fit into the overall system, will help you to be successful with many of the lessons in this course. Learn more about them in these [VEX Robotics Knowledge Base](#) articles:

<https://kb.vex.com/hc/en-us/categories/360002333191-V5>

- *You may have to copy and paste the links into a browser*
- [Robot Brain Overview](#) <https://kb.vex.com/hc/en-us/articles/360035953631-Overview-Robot-Brain-for-VEX-V5>
- [Smart Port Overview](#) <https://kb.vex.com/hc/en-us/articles/360035590612-Smart-Ports-Robot-Brain-for-VEX-V5>
- [Smart Motor Overview](#) <https://kb.vex.com/hc/en-us/articles/360035591332-Overview-Motor-for-VEX-V5>
- [Wireless Controller Overview](#) <https://kb.vex.com/hc/en-us/articles/360035589632-Overview-Controller-for-VEX-V5>
- [Robot Radio Overview](#) <https://kb.vex.com/hc/en-us/articles/360035590872-Overview-Radio-for-VEX-V5>
- [Robot Battery Overview](#) <https://kb.vex.com/hc/en-us/articles/360035589732-Overview-Battery-for-VEX-V5>

# System Power

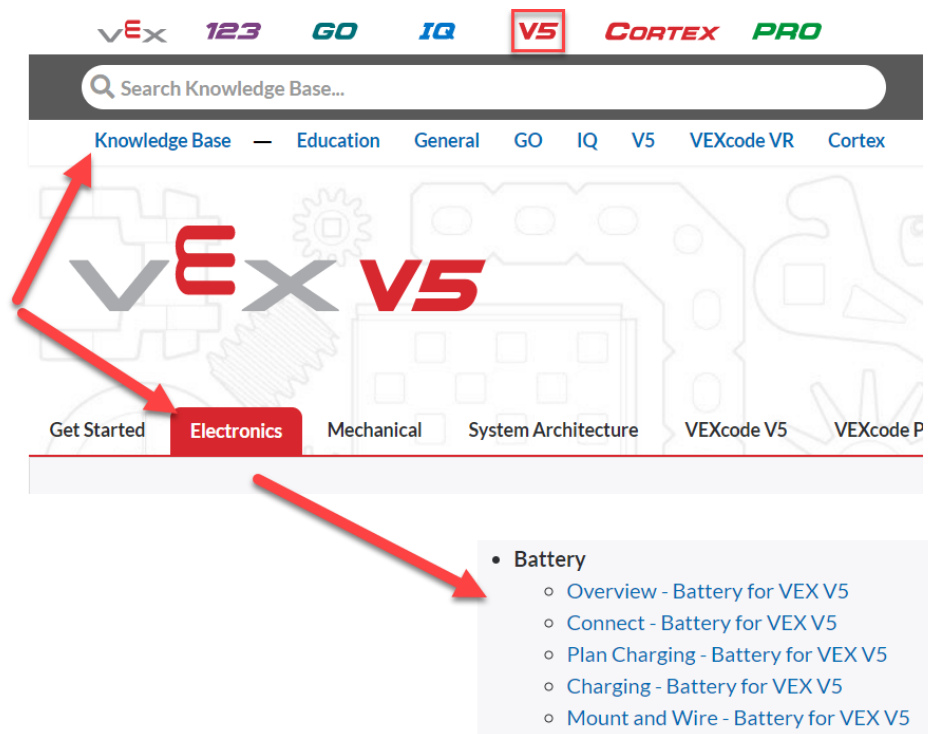
As you can imagine, one thing that a robot needs is **power**. The VEX EDR V5 robotics system includes a cutting-edge battery that provides consistent power output for its entire charge cycle. Before you update the robot system software or download programs to the Robot Brain, you should charge the Robot Battery.



# Attention:

- Charge the Robot Battery and connect it to the Robot Brain.
- It may take up to 60 minutes for the battery to fully charge.
- Pressing the physical button on the battery will indicate its charge level.

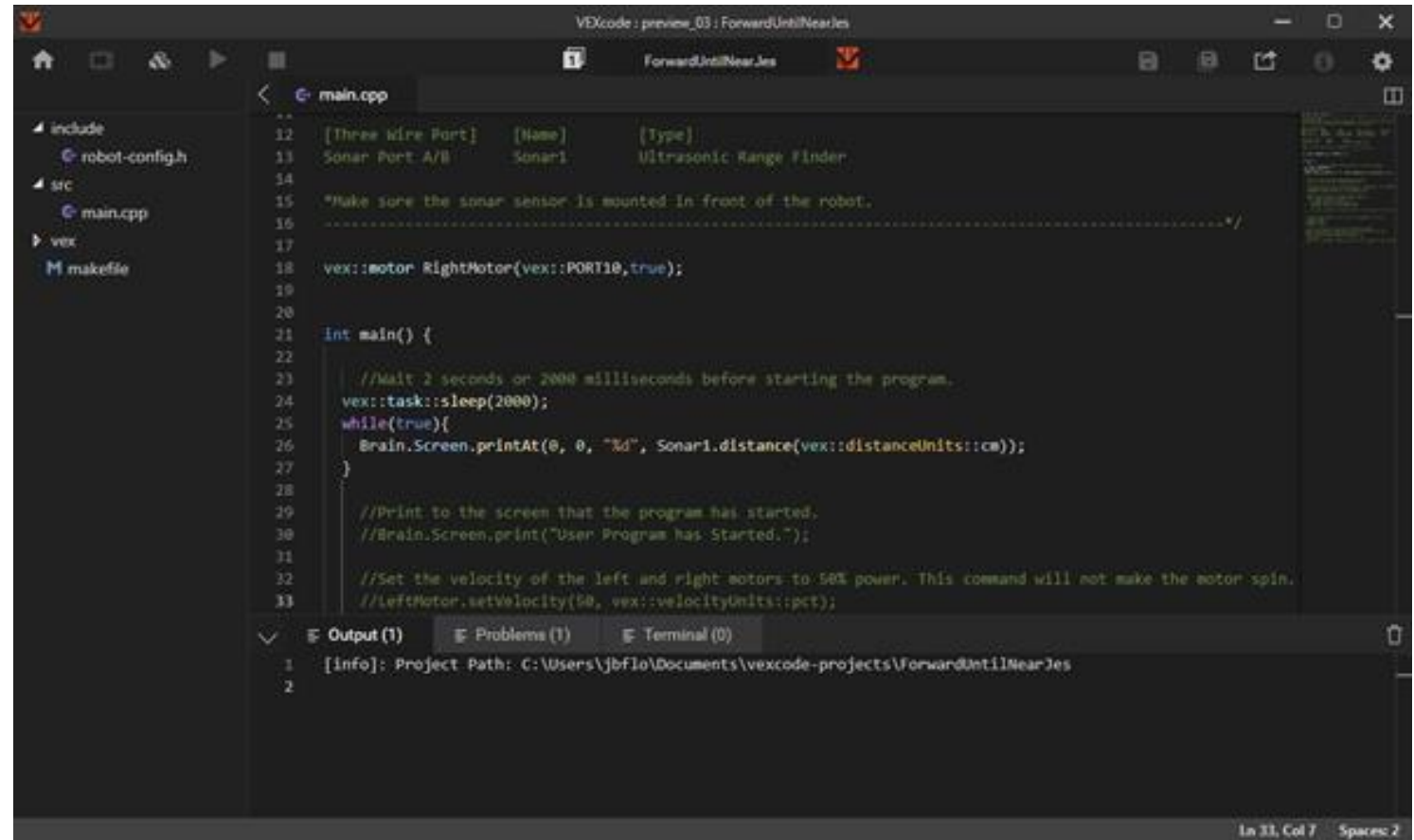
You can follow along with the guides from the VEX Knowledge Base if you would like additional support for charging and connecting the Robot Battery – Find them here:



# VEXcode Text (Now called “Pro”)

The VEX EDR V5 robotics system may be programmed through a variety of programming languages and environments.

The lessons in this course use the **VEX C++** programming language in the **VEXcode V5 Pro** programming environment.



The screenshot displays the VEXcode V5 Pro IDE interface. The main editor window shows a C++ file named `main.cpp` with the following code:

```
12 [Three Wire Port] [Name] [Type]
13 Sonar Port A/B Sonar1 Ultrasonic Range Finder
14
15 *Make sure the sonar sensor is mounted in front of the robot.
16 -----*/
17
18 vex::motor RightMotor(vex::PORT10,true);
19
20
21 int main() {
22
23     //Wait 2 seconds or 2000 milliseconds before starting the program.
24     vex::task::sleep(2000);
25     while(true){
26         Brain.Screen.printAt(0, 0, "%d", Sonar1.distance(vex::distanceUnits::cm));
27     }
28
29     //Print to the screen that the program has started.
30     //Brain.Screen.print("User Program has Started.");
31
32     //Set the velocity of the left and right motors to 50% power. This command will not make the motor spin.
33     //LeftMotor.setVelocity(50, vex::velocityUnits::pct);
```

The IDE also shows a file explorer on the left with folders for `include`, `robot-config.h`, `src`, `main.cpp`, `vex`, and `makefile`. At the bottom, the Output window shows the following message:

```
1 [info]: Project Path: C:\Users\jbf10\Documents\vxcode-projects\ForwardUntilNearJes
2
```

The status bar at the bottom right indicates the cursor is at line 33, column 7, with 2 spaces remaining.

# Installing VEXcode Pro V5

If you do not already have VEXcode V5 Pro installed, download and install it now. You will need administrative privileges on your computer to complete this process.

[The latest version of the software may be downloaded here.](#)

You can follow along with these guides from the VEX Knowledge Base if you would like additional support installing VEXcode V5 Pro:



# System Updates



The VEX EDR V5 Robot Brain is a fully programmable device that enables you to incorporate and control the motors, sensors, screen, and wireless controller.

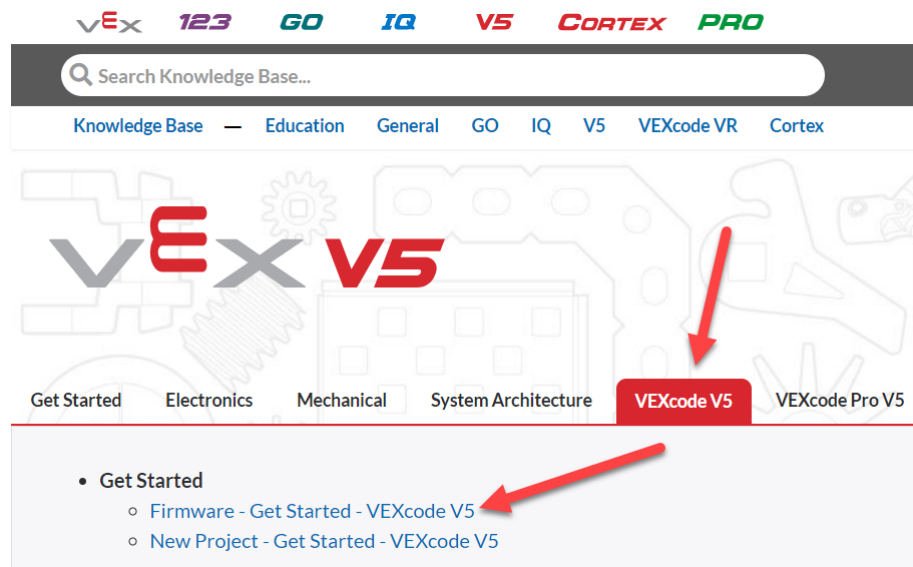
In other words, the **Robot Brain** controls the flow of power and information for the entire robot system.



Many of the electrical components of the VEX EDR V5 robotics system (Robot Brain, Smart Motors, Robot Battery, Wireless Controller, Robot Radio, Smart Sensors) contain their own processors and software in order to complete their specific roles. This component-specific software is often called **firmware**. The name for the firmware for the VEX EDR V5 robotics system is **VEXos**.

VEX has greatly simplified the process of keeping the VEXos firmware across these components up-to-date. When updating the VEX EDR V5 Robot Brain, all firmware updates for the other components are also transferred to the Robot Brain. Any time one of the components is connected to the Robot Brain, it checks that the firmware is up-to-date, and initiates an on-brain update process if it is out-of-date.

**Action:** Follow along with these guides from the VEX Knowledge Base to update the VEXos Firmware on your VEX EDR V5 Robot Brain and Wireless Controller. These steps will also update the VEXos Firmware (if necessary) on any connected Smart Motors, Radio, and Battery.



VEXcode will automatically check for new firmware and update it when you connect a brain to your computer.

*However*

A standalone VEXos updater is also available for both [Windows](#) and [Mac](#).

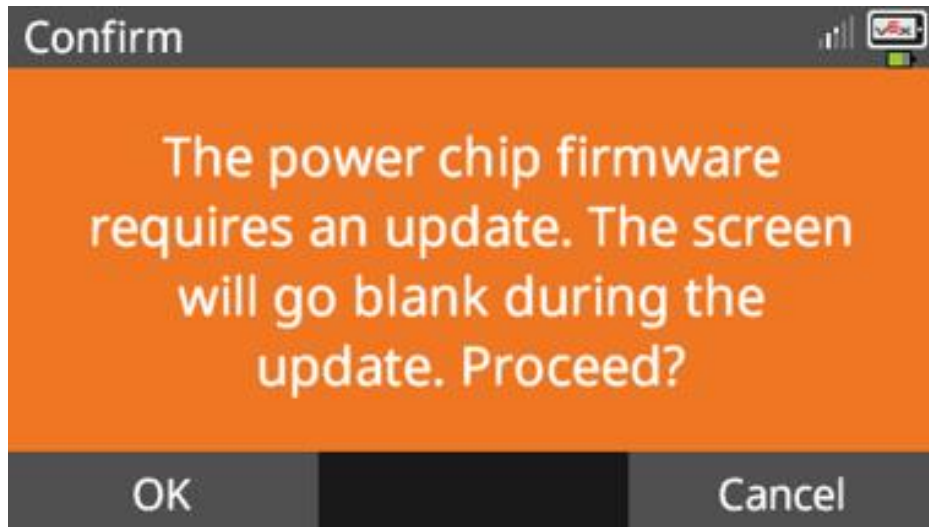
# Troubleshooting and Procedure Notes:

- We highly recommend keeping the battery connected to the AC Power Adapter and charging while completing the firmware updates.
- If the Robot Brain's screen does not turn back on after the initial firmware update, don't panic! Instead:
  - Press and hold the power button, making sure that the system is turned off (no other lights on).
  - Unplug the battery cable and plug it back in.
  - You should be able to power the robot back on.

After updating the Robot Brain, it is normal to see a series of on-screen prompts, asking to update other parts of the system.

This is expected behavior, which can also occur when you connect out-of-date components later to the Robot Brain.

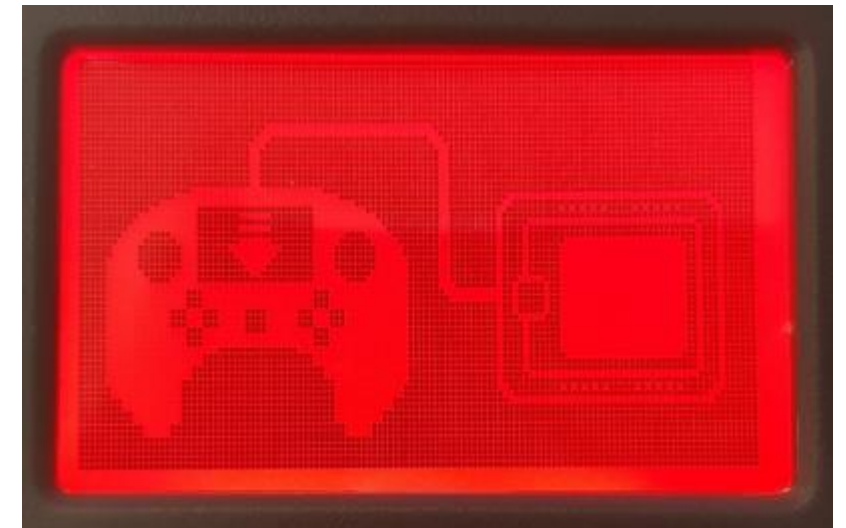
Press the OK button and allow them to run.



Robot Brain Update Prompt

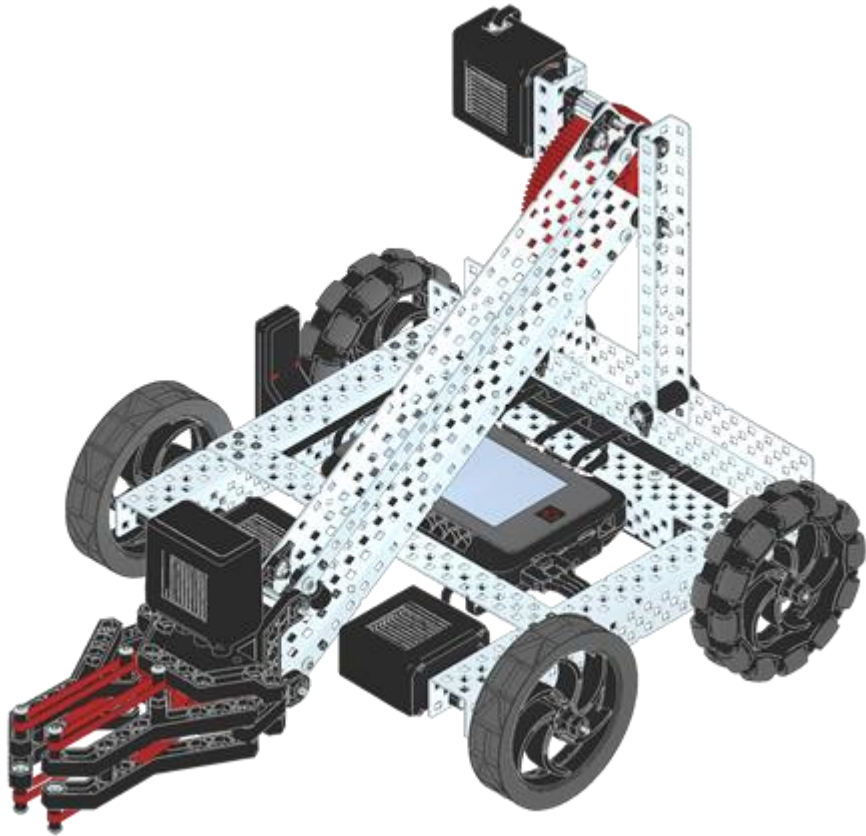
When updating the firmware on the Wireless Controller, the screen turns a deep red.

*This is normal, expected behavior*



Wireless Controller Update Screen

# Building Clawbot

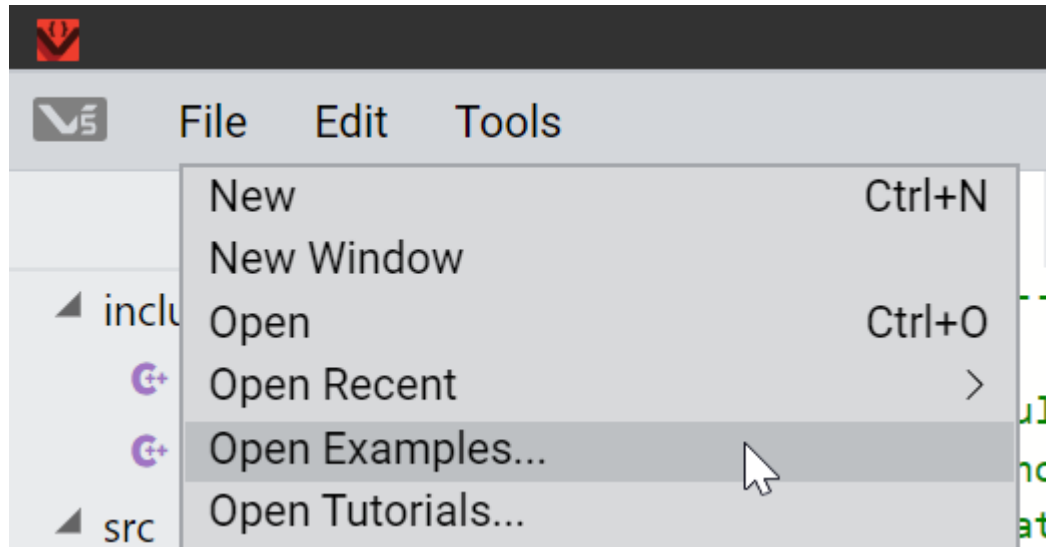


- Many of the lessons in this course are designed around the VEX EDR V5 Clawbot.
- The VEX EDR V5 Clawbot can be built with most VEX EDR V5 Bundles.
- Other robot configurations may be used with this course, but you may need to account for those differences in your programs.

**Action:** If you do not already have a built robot, follow along with these instructions to build the VEX EDR V5 Clawbot:

[V5-Clawbot-BuildInstructions.pdf 21.75 MB](#) *(You can safely ignore the virus warning in your browser)*

# Downloading Programs



Programs in VEXcode V5 Pro can be downloaded from your computer to the V5 Robot Brain through either a wired connection over USB, or a wireless connection over the link through the Wireless Controller.

To demonstrate this, we will download an Example Project from VEXcode to the Robot Brain.

**Action:** First, launch VEXcode V5 Pro and go to:

**File > Open Examples...**

## Examples

☰ Turning Right (degrees) Turns the robot right 90 degrees

### Looks

☰ Drawing Shapes Learn to draw shapes and lines on the V5 Brain's Screen.

☰ Printing Text Print text to the V5 Brain's Screen



### Control

☰ Comparing Values Print text based off of a random number

☰ Creating a Start Button Press the Brain's Screen to start your program

Cancel

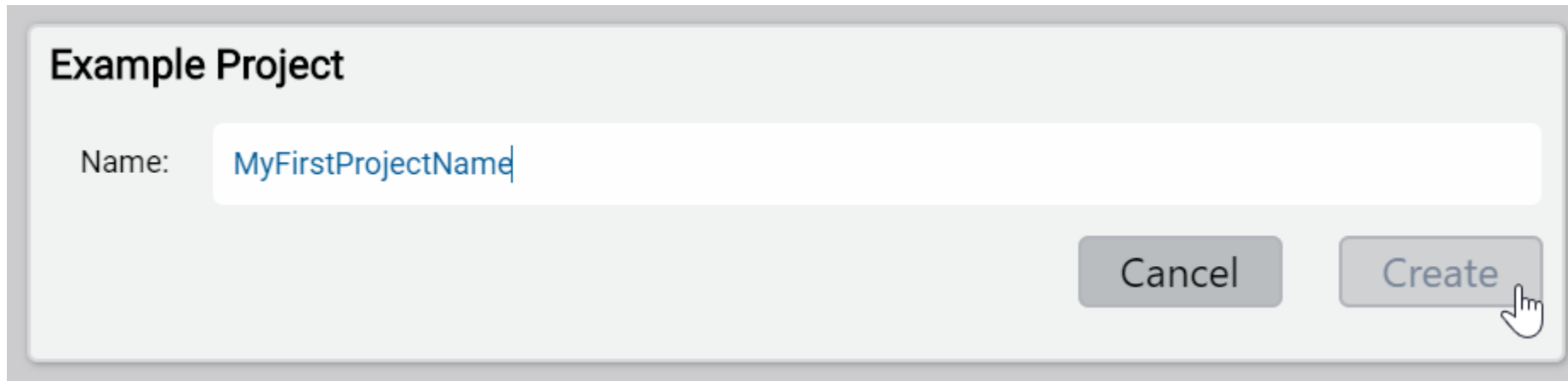
Next

Scroll through the available examples until you reach:

**Printing Text** and select **Next**.

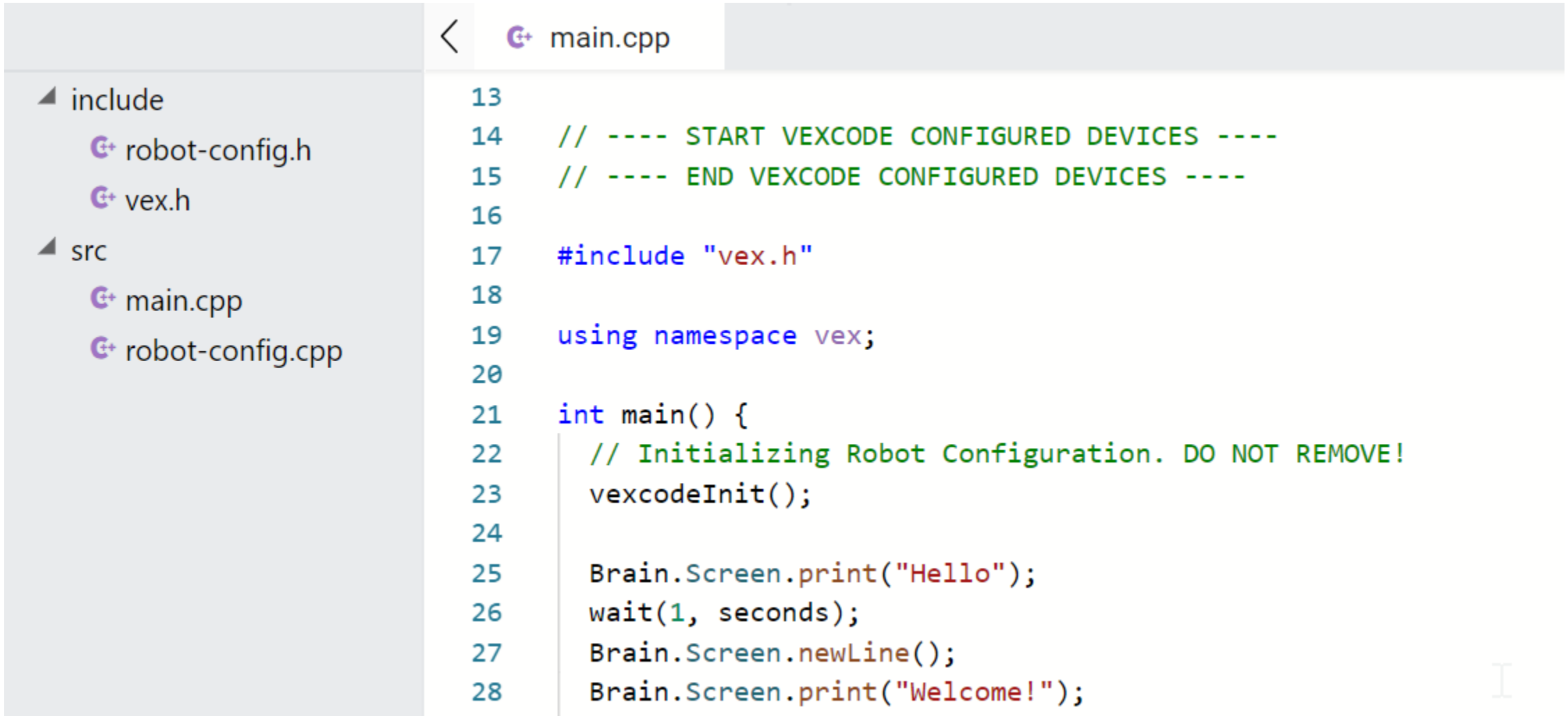
When prompted, provide a name for the Example Project

Then select **Create**.



The image shows a dialog box with a light gray background and a darker gray border. At the top left, the title "Example Project" is displayed in a bold, black font. Below the title, the label "Name:" is positioned to the left of a white text input field. The input field contains the text "MyFirstProjectName" in a blue font, with a vertical cursor at the end of the text. At the bottom right of the dialog box, there are two buttons: "Cancel" and "Create". The "Create" button is highlighted with a white mouse cursor icon pointing at it, indicating it is the intended action.

The code for the Printing Text Example Project should now be displayed in VEXcode V5 Pro.



```
13
14 // ---- START VEXCODE CONFIGURED DEVICES ----
15 // ---- END VEXCODE CONFIGURED DEVICES ----
16
17 #include "vex.h"
18
19 using namespace vex;
20
21 int main() {
22     // Initializing Robot Configuration. DO NOT REMOVE!
23     vexcodeInit();
24
25     Brain.Screen.print("Hello");
26     wait(1, seconds);
27     Brain.Screen.newLine();
28     Brain.Screen.print("Welcome!");
```



**Action:** Turn your VEX EDR V5 Robot Brain on and connect it to your computer through either a wired or wireless connection. (Choose one method!)

•**Method 1:** To create a wired connection, use the Micro-USB cable to connect a USB port on the computer to the VEX EDR V5 Robot Brain.

•**Method 2:** To create a wireless connection, you can [follow along with this tutorial](#) from the VEX Knowledge Base.

•*(Please copy and paste these links into a browser – PowerPoint doesn't open them automatically)*



**Action:** [Follow along with this guide](#) from the VEX Knowledge Base to download and run the Example Program on the VEX EDR V5 Robot Brain.

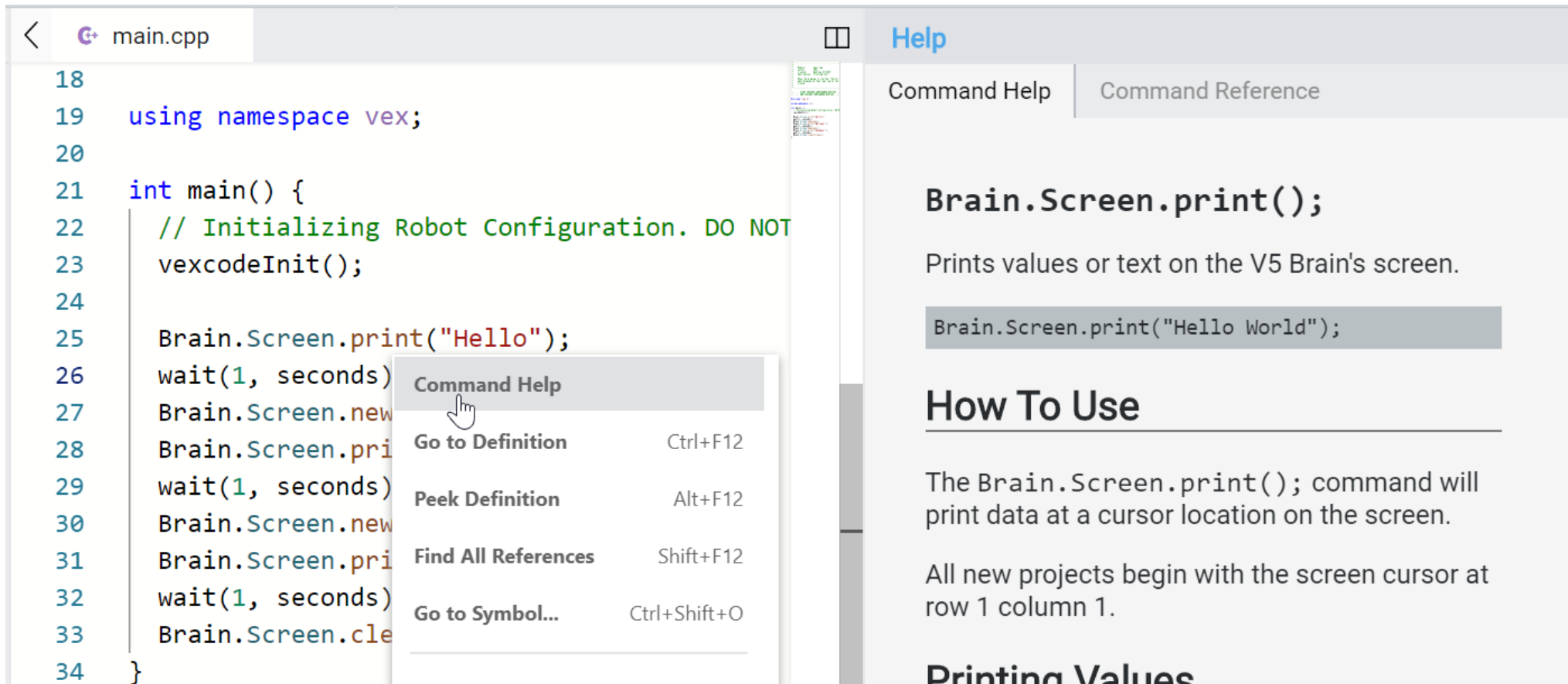
**Action:** Observe the program running on your VEX EDR V5 Robot Brain!

# Helpful VEXcode V5 Pro Features

VEXcode V5 Pro contains many features designed to help you write and troubleshoot your programs.

## Command Help

If you are unsure about a command in VEXcode V5 Pro, you can right-click on it and select Command Help. Doing so will open documentation specific to that command directly within VEXcode V5 Pro.



The screenshot displays the VEXcode V5 Pro interface. On the left, a code editor shows a C++ program with the following code:

```
18
19 using namespace vex;
20
21 int main() {
22     // Initializing Robot Configuration. DO NOT
23     vexcodeInit();
24
25     Brain.Screen.print("Hello");
26     wait(1, seconds)
27     Brain.Screen.new
28     Brain.Screen.pri
29     wait(1, seconds)
30     Brain.Screen.new
31     Brain.Screen.pri
32     wait(1, seconds)
33     Brain.Screen.cle
34 }
```

A context menu is open over the `Brain.Screen.print("Hello");` line, listing the following options:

- Command Help
- Go to Definition (Ctrl+F12)
- Peek Definition (Alt+F12)
- Find All References (Shift+F12)
- Go to Symbol... (Ctrl+Shift+O)

On the right, the Help panel is open, showing the documentation for `Brain.Screen.print();`. The documentation includes the following text:

**Brain.Screen.print();**  
Prints values or text on the V5 Brain's screen.

```
Brain.Screen.print("Hello World");
```

**How To Use**

The `Brain.Screen.print();` command will print data at a cursor location on the screen.

All new projects begin with the screen cursor at row 1 column 1.

**Printing Values**

# Command Reference

Available through the Help Menu, the Command reference provides a listing of currently available commands, along with brief descriptions. Additional commands are dynamically added as you configure motors, sensors, and other devices in your project. You can copy these commands directly into your code.

You can learn about additional helpful features within VEXcode V5 Pro in these tutorials from the VEX Knowledge Base:

- [VEXcode V5 Pro User Interface Overview](#)
- [Opening Example Projects](#)
- [Creating New Files](#)

*(Please copy and paste these links into a browser – PowerPoint doesn't open them automatically)*

