

FIRST® Tech Challenge Academy Professional Development Syllabus

Course Description

The *FIRST*® Tech Challenge Academy professional development is a 40-hour course that gives attendees a deep understanding of a *FIRST* Tech Challenge season and how to implement the program to achieve science, technology, engineering, and math (STEM) learning objectives. In *FIRST* Tech Challenge, students learn to think like engineers. Teams design, build, and program robots to compete in an alliance format against other teams with a spirit of friendly competition. Many call it “the hardest fun you’ll ever have.” Participants in this course will walk through the season as they engage in these hands-on experiences and practice engineering principles such as fabrication, 3D printing, keeping an engineering notebook, and planning for awards.

Course Requirements

FIRST® provides for use during professional development:

- *FIRST* Tech Challenge Robot kit - REV Robotics Kit
- Control and Communication Set
- Electronics Module, Husky Lens and Sensor Set

Participant Brings:

- Computer with internet access
- Download REV Hardware client software prior to first session – <https://docs.revrobotics.com/rev-hardware-client/>. This program is needed for all electronic hardware used to build the *FIRST* Tech Challenge robot and only operates on MS Windows OS device.

Mac Users: Please note that an Apple OS version of the hardware client is currently unavailable. To update the firmware and hardware, please refer to the *FIRST* Tech Challenge support documentation for detailed instructions on utilizing Manual Update Method 2 as outlined by REV. Instructions are found at https://docs.firstinspires.org/en/latest/ftc_sdk/updating/controlhub_os/Updating-the-Control-Hub-OS.html.

Course Objectives

By the end of this course, you will:

- Participate in the *FIRST* experience from a student’s point of view.
- Explore the essential components of the *FIRST* Tech Challenge program.
- Feel comfortable using hardware and software components of *FIRST* Tech Challenge robotics kits in addition to fabrication techniques and 3D printing.
- Feel comfortable using an advanced mecanum drive train.
- Understand how to code using Blockly programming software using autonomous and remote-control utilizing Vision Processing, Inertial Measurement Units, and Sensors.
- Know how to access additional resources.
- Be familiar with best practices for a competitive season.
- Learn how to facilitate hands-on activities for the classroom or after-school programs.
- Be able to foster computational thinking, collaboration, and problem-solving skills in students.
- Have experience with Project-Based Learning, the Engineering Design Process, and 21st Century Skills.
- Learn to build teams, participate in robot game matches, and present to judges.
- Utilize, model, and reinforce the *FIRST* Core Values!

Daily Topics

Day 1:

- Implement Core Value activities to help with team building and communication between team members.
- Investigate the *FIRST* Tech Challenge awards criteria.
- Develop an engineering notebook and discuss best practices for using a notebook.
- Implement different build methods using nonstandard robot material; explore various fabrication learning stations.
- Configure and build a robot using the REV Robotics Kit REV-45-2470.
- Explore the essential components of the *FIRST* Tech Challenge program.

Day 2:

- Explore Team sustainability strategies.
- Design and Build manipulators using nonstandard robotics parts.
- Program the robot to perform during a teleop period.
- Program servos using a SRS Programmer.
- Introduce the SCRUM work methodology.
- Implement different build methods using nonstandard robot material; explore various fabrication learning stations.

Day 3:

- Explore different types of robot chassis and various advanced mechanisms including linear slides and mecanum chassis.
- Program and use sensors to better control the robot.
- Program the robot to respond to 2 controllers at once.
- Program the robot for autonomous and teleop mode. Implement different build methods using nonstandard robot material; explore various fabrication learning stations.

Day 4:

- Compete in a scrimmage allowing each group to trouble shoot design issues their robot may have.
- Simulate how a true off season build day with other teams works.
- Discussion on building, technical issues, troubleshooting and other FAQ.
- Implement Core Value activities to help with team building and communication between team members. Implement different build methods using nonstandard robot material; explore various fabrication learning stations.

This day will be continuing to build and discuss, troubleshoot practice, and participate in scrimmages.

Day 5:

- This day will be mostly building, programming and discussion including:
 - Know how to access additional resources.
 - Be familiar with best practices for a competitive season.
- Go through a simulated competition day:
 - Complete with prep work
 - Judging
 - Robot competition