

Electrical Book of Pins

Rank: Rookie - knows how to use hand tools

Tools 1

Requirements & Evaluation:

1. Students know how to identify the tools by looking at it, and what it is used for. Ex: Crimpers, wire strippers, and heat shrink.
 - a. The student will be tested on their knowledge.
 - b. The requirement to pass is to get the majority of the tool's names and purposes correct.

Handwork 1

Requirements & Evaluation:

1. Students know how to use the hand tools to do basic tasks. Ex: Use the soldering iron to solder electrical components together. Or, alternatively, be able to use physical Arduino components.
 - a. The student has to explain how the tools work. Once the workshop opens, the student will show how they would use it.
 - b. The requirement to pass is to be able to use most of the tools given to them.

Electrical Knowledge 1

Requirements & Evaluation:

1. Students know the properties of electricity (Electricity flows when charges are opposite, and do not flow when charges are the same).
 - a. The student will explain the properties of electricity to the instructor.
 - b. The requirement to pass is having the ability to sufficiently explain the properties of electricity.

Safety

1. Students have read the safety guidelines and know electrical safety tips.
 - a. Electrical Safety

Rank: Apprentice - knowledge of electrical properties, more knowledge on hand tools

Vocabulary

Requirements & Evaluation:

1. Students know the main electrical vocabulary like Voltage (V), Current (I), and Resistance (R). (Voltage is the electrical potential, current is the “volume” of electrical charge, and resistance is the electrical restriction that counteracts voltage).
 - a. Students will explain in their own words what Volts, Currents, and Resistance mean.
 - b. The requirement to pass is to be able to explain those terms so that a person without any knowledge can understand.

Electrical Assembly 1

Requirements & Evaluation:

1. Students know how to put together basic electrical components with other Arduino Components
 - a. Students will be tasked to put together basic electrical components.
 - b. Students will also complete objectives on the Arduino and or create their own creation to show their knowledge.
 - c. The requirement to pass is having the ability to correctly put together those components on the robot and on the Arduino.

Rank: Master - using electrical tools, wiring different components, different laws and equations

Component Recognition

Requirements & Evaluation:

1. Students are able to identify different electrical components like a resistor, roboRio, Power Distribution Panel, etc. This will allow students to not rely on mentors for component recognition.
 - a. Students will be asked to identify different electrical components that are shown to them.
 - b. The requirement to pass is to be able to correctly identify the majority of the components.

Laws and Equations

Requirements & Evaluation:

1. Students know how Ohm's law works, $V = I \cdot R$ V being voltage, I being current (or amps) and R being resistance. Supplementing this, they can also calculate resistance in a wire with $R = \text{Material resistance} \cdot (\text{Length of wire} / \text{cross sectional area of wire})$
 - a. Students will be asked to explain how the equations work, and do some examples.
 - b. The requirements to pass is having the ability to explain sufficiently, and to be able to do the majority of the examples.

Electrical Assembly 2

Requirements & Evaluation:

1. Students can put together more complex electrical components like the roboRio, VRM, PDP, and Radio or complex Arduino Circuits.
 - a. Students will be tasked to wire together the main electrical components like the roboRIO, Power Distribution Panel, Voltage Regulator Module, and radio.
 - b. The requirement to pass is having the ability to wire up the majority of the components with few errors.

Tools 2

Requirements & Evaluation:

1. Students can use more advanced tools such as the soldering iron, ferrule crimpers, multimeter, battery beak and amp meter.
 - a. Students will be asked to identify and show how they would use the tools.
 - b. The requirements to pass is having the ability to correctly identify and use the majority of the tools.

Rank: Wizard - better knowledge of circuitry, more wiring of components

Electrical Knowledge 2

Requirements & Evaluation:

1. Students are able to understand more complex concepts and how the electrical components of the robot work, Ex: Motor controller, VRM, and roboRio and their purpose.
 - a. Students will be asked to explain how the electrical components work, which is important when trying to fix problems.
 - b. The requirement to pass is having the ability to explain the majority of the components.

Pneumatics Assembly 1

Requirements & Evaluation:

1. Students are able to assemble the pneumatics of the robot.
 - a. Students will be tasked to put together the pneumatics of the robot.
 - b. The requirements to pass is having the ability to do the majority of the assembling.

Rank: Legend - learning advanced electrical topics and how to fix problems with analysis

Robot Circuit Analysis I

Requirements & Evaluation:

1. Students are able to have a general knowledge of how the robot works in an electrical sense. They will also be able to read schematic diagrams and analyze circuits. This will allow them to solve electrical problems that may arise in the build season or during competition.
 - a. Students will be asked to explain how the robot works in an electrical sense.
 - b. The requirements to pass is having the ability to explain the majority of the electrical systems and to analyze schematic diagrams.

Adapt, Survive, and Overcome I

Requirements & Evaluation:

1. Students are able to work with the Mechanical and Software subteams.
 - a. Students will be tested by their time on the team.
 - b. The requirement to pass is having the ability to adapt to the requirements that the mechanical sub - team has for the electrical sub - team. It also requires the ability to work well with others.