

# Robotics Academy

## Lesson Overviews

### 2018

#### **Advanced Engineering**

*Advanced Engineering* will provide Academy trainees with the opportunity to expand on the basic engineering skills and knowledge provided in earlier lessons. This activity will also focus on the construction of attachments that contain motors and sensors to robots.

#### **Advanced Interfaces**

This activity will provide Academy trainees with the opportunity to expand on the basic interfacing skills and knowledge provided in earlier lessons. Advanced Interfaces will cover additional methods for interaction between man and machine.

#### **Advanced Programming**

*Advanced Programming* will provide trainees with the opportunity to expand on the basic programming skills and knowledge provided in earlier lessons. In *Advanced Programming*, trainees will engage in more sophisticated programming techniques with the EV3 Mindstorms programming language.

#### **Build Sessions**

During these nine sessions, trainees will work on their land robots. Tasks are distributed at the discretion of the trainees, generally based on things decided during the *Planning Session*. Responsibilities are not strictly assigned, and trainees have the freedom to switch between tasks and working partners. By final build sessions, trainees should have at most four robots capable of performing at *Competition*.

#### **Competition**

The Competition is the culmination of the trainees' week at Camp. After many hours spent designing, building, and testing their land-based robots, each team of trainees will be given a 10 minute window to complete as many of the tasks on the Challenge Table that they can. This is where their planning and building pays off, and the stress of the week becomes joy in the face of success. While each team competes others will learn about robotics after camp, and after competing teams will evaluate their week.

#### **Crazy Robots Now!**

Trainees will learn about the different types of robots being used and developed today. By learning about real world applications, trainees will be able to make connections between core principles of science and engineering and uses in their lives.

#### **Design Process**

Trainees discuss the Design Process used by engineers and will use these principles in designing and refining their own robots. To do this, the Crew Trainer leads trainees through the design

process in a hypothetical scenario of the team's choice. The process will then be used throughout the week.

### **Electronics Project**

Trainees will be given three one-hour sessions to learn about basic circuitry and build an electronics project. The first session will focus on learning about different electronic components. The final two of these sessions will be spent building their electronics project. After completion of the project, the trainees will be able to take it home.

### **Engineering**

In this activity, the trainees will learn about Lego and the Mindstorms system and how to create functional and efficient systems.

### **G.E.E.K.**

Students apply their knowledge from the week in a team competition.

### **History of Robotics**

This history lesson introduces trainees to the origins of the field of robotics, in order to equip trainees to address the questions: "What is robotics?" And "Who builds robots?"

### **History of Robots**

This history lesson presents a history of robots, as well as challenges the trainees to discuss the true definition of a "robot."

### **Logic**

Trainees will discuss and explain Boolean logic and how logic gates can turn binary inputs into different binary outputs. Trainees will then be challenged to design logic circuits to perform complex functions.

### **Numbers**

Trainees will discover the basics of the binary number system and how number systems operate using different bases.

### **Planning Session**

During the planning session, trainees will be briefed on the goals and rules of the Competition Table and the costs of materials. Teams will then discuss which objectives they would like to attempt on the Competition Table and how tasks will be distributed amongst the trainees. They will also decide which control system(s) they will use with their robots based on information given to them previously (*Wireless Control*).

### **Programming**

Trainees will engage in basic programming using the latest Lego MINDSTORMS programming software. They will use a visual programming language and will be taught how to use different types of command in the program.

**The Trials**

The Trials are a series of four mini-activities during which trainees must demonstrate an understanding of material covered in previous activities (*Engineering, Programming, and Wireless Control*). Trainees will receive bolts (team points) for performance and participation in these activities. Bolts earned are dependent on the complexity and difficulty of the challenges.

**Underwater ROV's**

Trainees will construct robots to compete in an *Underwater Challenge*.

**Wireless Control**

Trainees are introduced to the science of electromagnetic waves, their transmission and reception, and their use in controlling robots. The Lab Counselor will give a brief presentation on electromagnetic waves and radio communication, followed by an introduction to the RoCon software. After seeing how the program works, trainees will be given time to practice using it.