

UCSD StudentTECH 2020

Robotics Technology for Middle School Students

Sponsored by the San Diego Supercomputer Center and UCSD College Explorations at the University of

Blast Off, Space Crew! Beginning Robotic Adventures with Lego EV3

Monday- Friday, July 27-31, 2020

Course Overview

Discover the ultimate LEGO® challenge by combining LEGO® elements with an EV3 LEGO® MINDSTORMS® programmable brick, motors, and sensors to learn mechanical design, programming, strategy, innovation, robot performance, and innovative solutions to real-world problems.

Students will work as Scientists and Engineers, immersing themselves in motivating STEM activities that develop creative problem solving, communication, and teamwork skills.

This exciting space exploration curriculum includes: the Basics of Gears, Learning Missions, Challenge Missions, and Research Projects. Each mission and project is a fun and engaging STEM learning opportunity.

Basics of Gears: Students apply physical science and math principles to build effective robots.

Learning Missions: Students progress through seven distinct missions in which they investigate, observe, calculate, and apply their knowledge to solve specific tasks.

- Controlled Movements
- Precise Turns
- Turn Using sensor
- Detect a Color
- Detect an Object
- Follow a Line
- Detect & react

Challenge Missions: Students apply and creatively adapt programming and problem-solving skills to design and build robots to solve seven different space challenges.

- Space Challenge Rules
- Activate Communications
- Assemble Your Crew
- Free the MSL Robot

- Launch the Satellite Into Orbit
- Return the Rock Samples
- Secure Your Power Supply
- Initiate Launch

Research Projects: Students explore, plan, and develop around three fundamental challenges NASA Engineers and Scientists are trying to solve - how to ensure humans can survive in space, how humans create energy in space, and how robots can help humans explore space.

Course Goals

The goal of this course is to immerse students in STEM through the excitement of building and programming robots. Today's tools will be used to shape the minds of tomorrow's problem solvers.

How the Class Will Be Taught

This course will use a variety of instructional strategies to move students progressively toward a stronger understanding of automation and robotics and, ultimately, greater independence in engineering and programming. Students will be introduced to new topics through demonstrations or brief readings of mission objectives and suggested programming followed by the opportunity to put the concepts into practice. Each lesson or challenge will build upon the last. Students will be expected to work collaboratively to troubleshoot and to solve open-ended challenges.

Curriculum

LEGO® Engineering Conference Workbook

Tufts University Center for Engineering Education and Outreach

Topics to Be Covered

Module 1:

Level 1 – Introduction to LEGO MINDSTORMS® NXT

- Build and program a robotic LEGO vehicle to drive a certain distance.
- Program an NXT vehicle to collect data that will allow you to graph the vehicle's velocity.

Level 2 – Introduction to Sensors and Loop Blocks

- Program NXT vehicle to use touch & light sensors to stop.
- Program NXT vehicle to use a light sensor and loop to avoid a black line.

Level 3 – Open Ended Activities

- Light In The Tunnel
- Crawl From The Wall
- Follow A Line
- Complete A Maze

Module 2: Introduction To First Lego League

- Core Values
- Research Project

- Robot Game

Module 3: Introduction To Engineering

- STEM Careers
- Mechanical Gears
- VEX® Robotics
- Robot C Programming