

## Robotics – Syllabus

**Teacher:** Mr. Evans

**Email:** [mark.evans@hcps.org](mailto:mark.evans@hcps.org)

**Webpage:** <http://www.scienceandmathacademy.com/academics/robotics/>



**Text:** Cook, D., (2002). *Robot Building: for Beginners*. United States of America: Apress.

**Course Description:** This is a semester course which will teach the basics of robotics (analog). Students will understand the design of a line-following robot and build it. Through the course, a basic understanding of DC circuitry will be covered. DC circuitry topics will include: power sources, resistors, LEDs, variable resistors, comparators, and motors. Students will learn how to use a multimeter, set a circuit up on a solderless breadboard, solder wiring and circuits, design and create printed circuit boards (through-hole and surface mounted), use small hand tools and power tools. The use of a CNC-mill will be used at various times throughout the course. Exposure to robotics in the real-world will be covered through selected readings and a possible field trip.

**Course outline:** The below outline is a loose guide.

- Day 1
  - Course Introduction
  - Chapter 1 – Welcome Robot Inventor!
  - Chapter 2 – Where to Obtain Tools and Parts
  - Homework: Read chapter 3 & 4
- Day 2
  - Chapter 3 – Safety
  - Chapter 4 – Digital Multimeter
  - Homework: Read chapters 5 & 6
- Day 3
  - Chapter 5 – Numbers and Units
  - Chapter 6 – Robot Line – Following
  - Homework: Read chapters 7 & 8
- Day 4
  - Chapter 7 - Nine-Volt Batteries
  - Chapter 8 – Clips and Test Leads
  - Homework: Read chapters 9
- Day 5
  - Chapter 9 – Resistors
  - Homework: Read chapters 10 & 11
- Days 6
  - Chapter 10 – LEDs
  - Chapter 11 – Power On! Building and Testing a Power Indicator Circuit
  - Homework: None
- Day 7
  - Review of the first 11 chapters
  - Homework: Study for test 1

- Day 8
  - Test 1
  - Homework: Read chapters 21 & 22
- Days 9 & 10
  - Chapter 21 – Soldering Equipment
  - Chapter 22 – Soldering and Connecting
  - Surface mounted components (SMD)
  - Homework: None
- Days 11 & 12
  - Introduction to CNC-milling
  - Introduction to G-code, Eagle, and Mach3
- Days 13 & 15
  - Soldering and CNC assignment
  - Homework: Read chapter 12 & 13
- Days 16 & 17
  - Chapter 12 – Solderless Prototyping
  - Chapter 13 – Solderless Breadboard Setup
  - Homework: Read chapter 14
- Day 18 & 19
  - Chapter 14 – Variable Resistors
  - Homework: Read chapter 15
- Day 20 & 21
  - Chapter 15 – Comparators
  - Homework: Read chapter 16
- Day 22
  - Chapter 16 – Transistor Switches
  - Homework: Read chapter 17
- Day 23
  - Chapter 17 - DC Motors
  - Homework: Read chapter 18
- Day 24
  - Chapter 18 – Adding Gearhead Motors
  - Homework: Make a schematic for the circuit for the breadboard challenge
- Day 25
  - Breadboard circuit challenge
  - Homework: Read chapter 19
- Day 26 & 27
  - Chapter 19 – Wheels
  - Homework: Read chapter 23
- Days 28 through 38
  - Chapter 23 – The Motherboard
  - Chapter 24 – Body Building
- Days 39 & 40
  - Chapter 25 – Launching the Line-Follower
  - Homework: Read chapter 26
- Other days

- Extra days may be inserted from time to time.

**Grading:** All grades are determined by total points.

- **Test:** 100 points
- **Homework:**
  - There will be discussions based on the readings. Your participation in those discussions will be worth 50 points. *Quarter 1 only*
  - Selected readings 50 points. *Quarter 2 only*
- **Class work/Mini-Labs:** 10-25 points
- **Soldering/CNC assignment:** 50 points
- **Motherboard circuit board:** 100 points
- **Robot:** 250 points (Further details of grading of the robot will be on a separate handout.)
- **Lab notebook:** 40 points every time they are collected (1-2 times per quarter)