

Robotics – Syllabus

Teacher: Mr. Evans

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



Text: Cook, D., (2002). *Robot Building: for Beginners*. United States of America: Apress. (Used as a resource, but not assigned.)

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 (visible and IR), variable resistors, photo transistors, 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 circuit board plotter (LPKF E33) and a CNC-mill will be used at various times throughout the course. Exposure to robotics in the real-world will be covered through selected reading.

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
- Day 2
 - Chapter 3 – Safety
 - Chapter 4 – Digital Multimeter
- Day 3
 - Chapter 5 – Numbers and Units
 - Chapter 6 – Robot Line – Following
- Day 4
 - Chapter 7 - Nine-Volt Batteries
 - Chapter 8 – Clips and Test Leads
- Day 5
 - Chapter 9 – Resistors
- Day 6
 - Chapter 10 – LEDs
 - Chapter 11 – Power On! Building and Testing a Power Indicator Circuit
 - Chapter 12 – Solderless Prototyping
 - Chapter 13 – Solderless Breadboard Setup
- Day 7-8
 - Introduction to CNC-milling
 - Introduction to G-code, Eagle, and Mach3
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- Day 9
 - Review of the first 11 chapters
 - Homework: Study for test 1
- Day 10
 - Test 1
- Day 11 & 12
 - Chapter 14 – Variable Resistors
- Day 13 & 14
 - Chapter 15 – Comparators
- Day 15
 - Chapter 16 – Transistor Switches
- Day 16
 - Chapter 17 - DC Motors
- Day 17
 - Chapter 18 – Adding Gearhead Motors
- Days 18 & 19
 - Chapter 21 – Soldering Equipment
 - Chapter 22 – Soldering and Connecting
 - Surface mounted components (SMD)
- Days 20 & 21

- Soldering assignment
- Day 22
 - Chapter 19 – Wheels
- Days 23-25
 - EAGLE
 - PCB assignments
- Days 26 through 36
 - Chapter 23 – The Motherboard
- Chapter 24 – Body Building
- Days 37 & 38
 - Chapter 25 – Launching the Line-Follower
- 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 selected reading assignment for homework. The following class there will be discussions based on the reading, your participation in those discussions will be worth 50 points.
- **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:** Notebooks are collected with each assignment and will be $\frac{1}{4}$ to $\frac{1}{2}$ of the grade for each assignment. Notebooks are electronic. Access them through portal.hcps.org and you should be able to open in from the OneDrive under “Shared with me”.
- Other assignments as needed. Mr. Evans reserves the right to adjust the above grading.