Introduction to Robotics

Course will teach elementary electronics and computer programming aimed at fabricating and programming a small 2 wheel robot. The robot will be supplied in kit form requiring common hand tools to assemble. It will require a PC to build and download student generated programs.

Proposed robot kit plus batteries and cables are expected to cost approximately $75 and are available via the instructor or thru the internet. Teams are encouraged and individuals with their own hardware are welcome to attend but the focus will be completion of the proposed course content.

The duration will be 10 sessions with some outside class work expected.

Typical presentation scheme is a short lecture with handout discussing the topic at hand followed by the student installing hardware and software that exercises the feature. This would be followed by a discussion of the limits of the particular component, and finally a challenge for the student to implement a more complex solution aimed at solving a challenge. All software will have a prebuilt solution for those who might not feel comfortable. Four sessions allocated for instructor assisted hands on lab type work.

Session	Subject Matter
1	Construction Materials Aluminum Plastics Wood Kits vs homebrew Micro controllers vs PC Tools of the trade Breadboards Soldering Jumpers Multimeters Oscilloscopes Logic Analyzers Software development tools
2	Basic Electronics Resistors, Capacitors, Inductors, LEDs Power Estimating requirements Batteries Power regulators Motors Hobby Servo Speed Typical Pulse Gear-head HBridge PWM

PID
Fabrication of robot kit
Assemble base kit
Verify proper electrical connections
Test with pre-built program

3 Intro to Programming Languages
Assembler => C => Interpreters => Scripts
Adruino
IDE
Startup
Main Control
Debug features
Interrupts
Installation of Arduino IDE on student laptops
Build and download simple example programs
Blink the LED
Serial Print

4 InfraRed Distance sensors
Discussion of the technology and its limitations
Add the IR hardware to robot
Program IR software to detect objects

5 IR Lab
Contest to measure reaction to moving target using IR

6 Wheel encoders
Discussion of importance of feedback to reliable navigation.
Encoder technologies
Optical
Magnetic
Noise
Add the wheel encoder hardware/software to the robot.
Intro to the PID algorithm (instructor to supply code)

7 Encoders Lab
Contest using the encoders to navigate a simple predefined course.

8 Sonar distance sensors
Discussion about the use and limitations
Assemble and wire the sonar unit
Apply supplied code

9 Sonar Lab
Contest that utilizes sonar to avoid obstacles

10 Wrapup Lab
Other types of peripherals available to the hobbyist
Student requests