Line Following Robot Project

The culminating activity consists of three parts. In Part 1 you will demonstrate your skills in assembling electrical and mechanical components and building electronic circuits on breadboards. Part 2 is designed to evaluate your ability to integrate your knowledge of electronics and computer hardware with your programming skills. In Part 3 you will complete a self-evaluation sheet and reflect on what you have learned from this project.

Part 1

1. Following the instructions on the worksheet, assemble the breadboard, gear motors, wheels and dowel to create the robot.
2. Using the integrated circuits, and voltage regulator provided, build the motor control circuit on the breadboard. Both a schematic and pictorial diagram are included on the worksheets. You may also refer the data sheets for the integrated circuits for more information.
3. Connect the wires from the gear motors to the Y outputs on the L293D chip, as shown on the circuit diagram.
4. The last step is to connect the battery to the circuit and test it. Download the test program to the PICAXE, and check that the motors turn in the correct direction for each phase of the program.
5. Download the program you have written using the PICAXE programming software, and demonstrate the working robot.

Team Members: _____

	Level 1 (50-59%)	Level 2 (60-69%)	Level 3 (70-79%)	Level 4 (80-100%)	Value
Robot Assembly	Wheels misaligned, parts loose or missing.	Robot parts assembled carelessly.	All parts of the robot put together correctly.	All parts of the robot put together precisely.	10
Circuit Board Assembly	Parts are missing and the wiring is sloppy.	The circuit is almost complete, and the wiring is competent.	All the electronic components are connected correctly.	The circuit is assembled accurately and neatly	15
Soldering and Cable Assembly	Parts were destroyed on the first attempt.	Too much solder, or too little solder and loose connections.	Solid connections, bright finish on joints.	Very precise joints, solid connections, bright finish.	10
Circuit Board Operation	Half of the circuit works when demonstrated.	Circuit works correctly on second attempt.	Correct circuit operation demonstrated.	Circuit works and is completed long before deadline.	10
Line Sensors	The line sensors work, but are not adjusted properly.	The line sensors operate most of the time.	The line sensors consistently detect black and white.	Level 3 + original, successful design for sensor mounts.	10
Safety	Often forgets safety procedures.	Usually wears protective equipment	Always wears protective gear	Works safely and reminds others	10

	Comments	Mark	Value
Robot Assembly			10
Circuit Board Assembly			15
Soldering			10
Circuit Board Operation			10
Line Sensors			10
Safety			10
Total			65

FINAL PROJECT

Part 2

Before beginning this assignment, at least one member of the group must be conversant with programming in PICAXE Basic. In the second part of the project, you will write a program that will send signals to the robot—via the parallel port—to cause it to move forward or backward, or turn to the left or right. Each student individually will be required to demonstrate to the examiner the ability to find and solve problems in the external circuitry and in the program code.

Assignment:

1. Complete the programming tutorials from the PICAXE manual Part 1.
2. Have the instructor initial your worksheet each time you complete a tutorial.
3. Write a program that will cause the robot to follow a line on the Slalom Course or the Road Course, or both.
4. Demonstrate your finished program(s) to the examiner.

Team Members: _____

Part 2	Level 1 (50-59%)	Level 2 (60-69%)	Level 3 (70-79%)	Level 4 (80-100%)	Value
Programming Exercises	Completed five PICAXE tutorials.	Completed six PICAXE tutorials.	Completed seven PICAXE tutorials.	Completed eight or nine PICAXE tutorials.	20
Programming Skills	Program works, but code is undocumented.	Program works, but code is inefficient.	Code is effective, logically organized, and well documented.	Code is efficient, very well documented.	10
Slalom Course	The robot has a mind of its own	The robot can navigate the slalom course, with help	The robot reliably follows the slalom course.	The robot is one of the fastest on the slalom course.	10
Road Course	The robot gets confused at intersections	The robot reaches the end of the course	The robot successfully navigates the road course and returns.	The robot is one of the fastest on the road course.	10

	Comments	Mark	Value
Programming Exercises			20
Programming Skills			10
Slalom Course			10
Road Course			10
Total			50