Robotics Course Syllabus

A. Description
We have the ability to use our hands and cognitive skills to work together. This course involves a cognitive understanding of the process of designing a robot. This class gives students a real life experience on what it takes to be a professional engineer.

B. Organization
There will be four major components of this class: team work, research, design, meeting challenges. You will be graded on how well you follow and complete all the objectives. You will be introduced to small machines and explain how they are used in conjunction with each other to create a robot. You will be given a series of instructions. Your job is to be able to meet the objectives while working as a team. I will guide you through the process, but I will not give you the answers. You will need to learn how to mesh as a team. Everyone has his/her strengths and you will discover what they are and how to use them.

C. Materials:
Each team will have a team log. All work will be recorded in the journal. Students should record their individual ideas as well as the blue prints agreed upon and used by the team.

Color pencils, pencils, paper clip are all recommended.

D. Course Objectives
1. Create a team name and choose roles for each person on the team. You may use the roles we have in the class or create roles as a team. An explanation of roles must be described on page 2 of your journal. Give an example of a task that role would perform and a quote of what they might say. (Be specific to robotics.) A list of who is assigned to each role will be on page 3 of the journal. Remember, your grade will be based on how well you work together. All students have contributed **EQUALLY**.

2. Task 1: Research simple machines and the history of robotics. Take research and write an essay explaining what was learned from the research. Every person is responsible for turning in a paper.

3. Task 2: Complete the cloze activity for the Introduction to LegoMindstorm video.

4. Task 3: Using the NXT User Guide explore each of the parts listed below. Record in the team journal.
   a. light sensors-pros and cons of use
   b. ultrasonic sensors-pros and cons of use
   c. touch sensors-pros and cons of use
   d. servo motors-how do they work? What simple machines are employed? Are there other motors used to make robots move?
   e. how does the brain work? How can you program the robot? What types of things can the robot do?

E. Challenges
5. For each challenge you must design a blue print in your team log. This will allow you to see your original design and any changes you make in making sure your robot meet's its objective. Remember to label each part and explain how many you need of each part.
6. Design blue prints combining various simple machines to meet objectives and challenges.

7. Build the robot. You MUST create the blue prints while building the robot. This will enable you to see if you included everything you need on the blue print. If you find that as you are building your robot you need more parts, you also need to add those parts to the blue print.

8. Try out your robot to see if it meets the objectives. Make changes if necessary. Be sure to record corrections on the blue prints. Your team log will be collected for grading. Be sure it is accurate and up to date. This is an engineering class. Use color, make drawings, label, label, label.

9. When you are ready to have your robot tested, make an appointment with Ms. Hendrix. Bring your robot, your team and your team log. Remember, there is more than one way to meet any objective. Your robot must go through two trials. The grade will be an average of the two runs.

F. Grading Plan
You will follow the rubric for the guidelines provided. If you meet the criteria for an A, you will receive an A, etc. All group members must work together as a team. If at any time arguing occurs, your grade in this area will go down. All members must have input into every aspect of the project. You will all have to compromise at times for the betterment of the team. If a person is absent, you all have to pick up the slack. If you save the work for that person to do when they return, you may miss a deadline.

G. Deadlines
Group 1
1. Essay – Simple machines and the history of robotics due March 31
2. Introduction to Lego Mindstorms cloze due March 27
3. Challenge 1: Turn-A-Bout due Friday, April 4
4. Challenge 2: Bumpity, Bump, Bump due Friday, April 25
5. Challenge 3: Guiding Light, Friday, May 2
6. Challenge 4: Ultra Controlled, or The Choice is Yours, Friday, May 16

Group 2
1. Essay – Simple machines and the history of robotics due Friday, May 23
2. Introduction to Lego Mindstorms cloze due Tuesday, May 20
3. Challenge 1: Turn-A-Bout due Friday, May 30
4. Challenge 2: Bumpity, Bump, Bump due Friday, June 6
5. Challenge 3: Guiding Light, Friday, June 13
6. Challenge 4: Ultra Controlled, or The Choice is Yours, Friday, June 20
Challenge 1: Turn-A-Bout

In this challenge, your objective is to make your robot complete a course containing the following elements/moves.

1. begin at the start line
2. travel one meter
3. make a left turn
4. travel one meter
5. make a left turn
6. travel one-half meter
7. stop behind the finish line.

The use of sensors is prohibited in this task.
Challenge 2: Bumpity Bump, Bump

In this challenge your objective is to make your robot complete a course containing the following elements/moves.

1. Start your robot at least one meter from the wall.
2. Have your robot move forward toward the wall until touches the wall.
3. Your robot should stop, back up at least 20 centimeters, and make a 180° turn.
4. Then move forward returning to its original position.

<table>
<thead>
<tr>
<th>Bumpity Bump Bump</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Travels one meter</strong></td>
<td>Robot travels one meter</td>
<td>Robot travels within 3 cm of one meter</td>
<td>Robot travels within 6 cm of one meter</td>
<td>Robot travels &lt; or&gt; 10 cm of one meter</td>
</tr>
<tr>
<td><strong>Stops</strong></td>
<td>Robot stops forward movement when it hits the wall</td>
<td>Robot stops forward movement after within 2 seconds</td>
<td>Robot stops forward movement after within 5 seconds</td>
<td>Robot does not stop forward movement</td>
</tr>
<tr>
<td><strong>Backs up</strong></td>
<td>Robot backs up 20 centimeters</td>
<td>Robot backs up within 3 cm of one meter</td>
<td>Robot backs up within 6 cm of one meter</td>
<td>Robot backs up &lt; or&gt; 10 cm of one meter</td>
</tr>
<tr>
<td><strong>Make 180° turn</strong></td>
<td>Robot makes a 180° turn</td>
<td>Robot makes a turn within 5° of 180°</td>
<td>Robot makes a turn within 10° of 180°</td>
<td>Robot makes a turn at &lt; or&gt; 10° of 180°</td>
</tr>
<tr>
<td><strong>Travels to point of origin and stop</strong></td>
<td>Robot travels to point of origin and stops</td>
<td>Robot travels to point of origin and stops within 3 cm</td>
<td>Robot travels to point of origin and stops within 6 cm</td>
<td>Robot travels to point of origin and stops 10 cm</td>
</tr>
</tbody>
</table>
Challenge 3: Guiding Light

In this challenge your objective is to make your robot complete a course containing the following elements/moves.

Use your light sensor. Follow the curved white path. This challenge is hard to do.

<table>
<thead>
<tr>
<th>Guiding Light</th>
<th>10</th>
<th>7</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Robot follows the path. Returns to the path from the left or right side.</td>
<td>Robot follows the path. Returns to the path from one side of the path but not the other</td>
<td>Robot does not follow the path.</td>
</tr>
</tbody>
</table>
Challenge 4A: Ultra Controlled

In this challenge your objective is to make your robot complete a course containing the following elements/moves.

1. Start your robot at least 2 meters from the obstacle.
2. Have your robot move forward toward the obstacle until it senses its presence (5-10 cm).
3. Your robot should stop, turn 90°, move forward 15-20 cm, turn 90°,
4. Then move forward until it senses the next obstacle.
5. Your robot should stop, turn 90°
6. Then move forward until it senses the next obstacle.
7. Your robot should stop, turn 90° move forward and stop when passes the start line. Thus, circling the first obstacle.
Challenge 4B: The Choice is Yours

Go to the Lego Mindstorm website. View various robots. Choose a robot you would like to build and program. Submit the form below to Ms. Hendrix.

Robotics Grade Plan Sheet  
*(Student copy)*

Team members: ___________________________________ Final Project due: **Feb 5th**

<table>
<thead>
<tr>
<th>Project name</th>
<th>Building level</th>
<th>Due date</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Robotics Grade Plan Sheet  
*(Teacher copy)*

Team members: ___________________________________ Final Project due: **June 20**

<table>
<thead>
<tr>
<th>Project name</th>
<th>Building level</th>
<th>Due date</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>