General Information:

Instructor:	Darren Dawson (ddarren@clemson.edu) Office: Riggs 105 Office hours by appointment only
TAs:	Nick Watts (nwatts@clemson.edu) Office: Fluor Daniel 352 Available during scheduled class times or by appointment
Location:	Holtzendorff Project Lab (Room B-01)
Meeting Time:	Tuesday 4-8, Thursday 5-7
Course Webpage:	http://www.clemson.edu/ces/departments/ece/undergrad/mindstormslab.html
Credits:	1

Course Description:

In this ECE robotics project, student teams will learn engineering and design principles by building and programming robots with Lego Mindstorms and MathWorks MATLAB. The Mindstorms kits allow for easy construction of advanced robots complete with servo motors and a variety of sensors. Using MATLAB, a mathematical programming tool widely used in industry and academia, to control the robots opens up a vast feature set beyond that provided by the basic Mindstorms software. In the first part of the class, students will go through several preliminary experiments to learn the basics of controlling the robot's motors and reading from its sensors with MATLAB. Those sensors include touch, light, color, and ultrasonic. Also, MATLAB and its built in image processing functionality makes possible the use of a standard webcam as an additional sensor. After gaining a firm understanding of the fundamentals of design and the use of the Mindstorms and MATLAB toolbox, these student teams will complete a design challenge by designing, building, and programming their own two-legged walking robot.

Attendance Policy:

The Holtzendorff project lab will be available during the scheduled class meeting time for students to work on projects. The TA will be there during those times to answer questions and provide assistance. Students can stop in at any time during those hours. Students will be also able to take the Mindstorms kits with them and work on the projects outside of class if they choose, so attendance is not required. However, students will have to come during one of the scheduled meetings each of the first five weeks to get their work on the lab for that week checked off.

Schedule (Subject to Change):

Item	Due Date
Weekly progress & individual participation	Semester long
Introduction to class	Week of 9/5
Sample robot construction & Lab 1 (Connections)	Week of 9/12
Lab 2 (Motors)	Week of 9/19
Lab 3 (Touch Sensor)	Week of 9/26
Lab 4 (Color & Light Sensors)	Week of 10/3
Lab 5 (Ultrasonic Sensor)	Week of 10/10
Introduction to final project	Week of 10/17
Robot Prototype & Progress Report	Week of 11/7
Finished robot & Final Report/Presentation	Week of 12/5

Grading:

Completion of all assignments is required. Grades will be heavily based on participation and effort put forth in each part of the class. Since attendance is not required, the two reports and presentation are the place to demonstrate effort. Reports and presentations that clearly describe the students' methods for working through and solving problems will be scored high.

The prototype should demonstrate progress towards the final goal. Each group should have finished building their robot and should have begun the programming phase. The progress report should be no more than 1 page and the final report no more than 2. Both should include specific examples of challenges met and how they were overcome.

The final presentation will be submitted by email. Instructions will be given for recording narration in PowerPoint. The presentation must also include a video of the robot in action. It should be approximately 5 minutes long and cover much the same material as the reports.

Academic Integrity

Clemson University's academic integrity policy reads: "As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a "high seminary of learning." Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form." Students will be held to this standard.

ENGR 190 Biped Project

Summary

The final project for this class is to build and program a two legged walking robot. The robot should be able to stand and walk forward unaided. At the end of the semester, there will be a competition to see which team's robot can move the fastest. The robot should also include some sort of sensor to prevent it from walking into obstacles.

The design, construction, and programming of the robot are completely up to you. However, the only building materials allowed are those provided in the Mindstorms kit given to each team. There are building instructions for several different models of bipeds available on the Internet. If you choose to base your design on plans found elsewhere, be sure to cite the source of the design and explain why you chose that design over any others in your report. Also, any MATLAB code submitted must have been written by your team. As with the design, you are free to base your code on control algorithms found on the Internet or elsewhere, but you must cite your sources and explain your choices in your reports.

Due Dates

Week of 11/7	Robot prototype and progress report
Week of 12/5	Finished robot, final report and presentation

Reports

There are two reports due for this project. These reports should document how you went about the design and programming processes. They should include problems that arose and how you adapted your design or program to deal with them. Also, they should explain how your MATLAB program works to keep the robot balanced. The progress report should be no longer than 1 page and the final report no longer than 2 pages.

Presentation

In the final presentation, your team will present your project to the instructor. As with the reports, you should explain how your program works and also any major challenges that you encountered during the project and how you dealt with them. The presentation should last about 5 minutes. You should create a PowerPoint presentation and record narration over it. Instructions on how to do that are available on the course webpage. The presentation must also include a video of your robot in action.

Welcome to ENGR 190

Mindstorms Meets Matlab

Solving the Rubik's Cube

For the video,
http://www.youtube.com/watch?v=OtYtdC5eFj4&feature=related

General Information

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	Holtzendorff Project Lab
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	Office hours by appointment only
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	Office: Fluor Daniel 352
	Office hours by appointment

Course Webpage

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- Syllabus
- Lab manuals
- Sample projects

Class Schedule

- Week 1: Introduction
- Weeks 2-6: Labs
- Weeks 7-14: Design project
- Week 15: Final presentations

Class Schedule

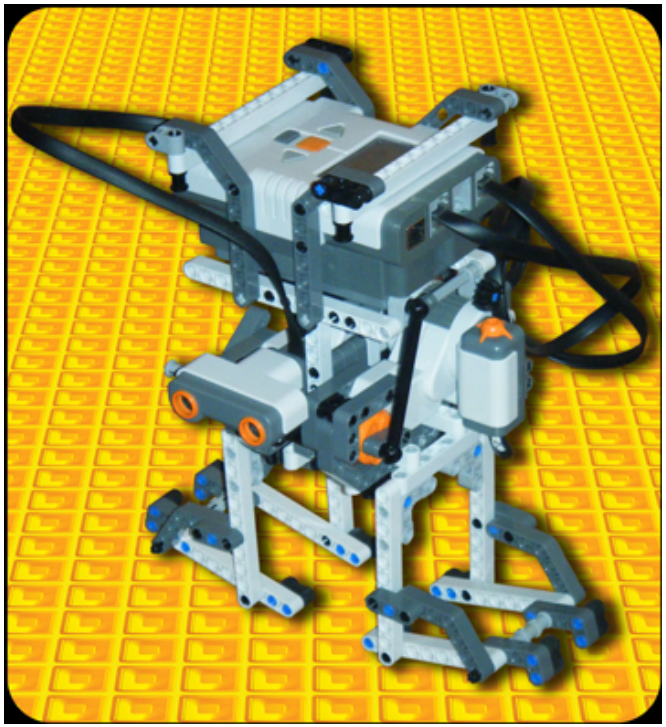
Item	Due Date	% Grade
Weekly progress & individual participation	Semester long	10
Introduction to class	Week of 9/5	-
Sample robot construction & Lab 1 (Connections)	Week of 9/12	5
Lab 2 (Motors)	Week of 9/19	5
Lab 3 (Touch Sensor)	Week of 9/26	5
Lab 4 (Color & Light Sensors)	Week of 10/3	5
Lab 5 (Ultrasonic Sensor)	Week of 10/10	5
Introduction to final project	Week of 10/17	-
Robot prototype & progress report	Week of 11/7	20
Finished robot & final report	Week of 12/5	20
Final presentation	Week of 12/5	25

Logistics

- Place: Holtzendorff Project Lab
- TA: Nick Watts
- Project Lab Schedule
  - Tuesdays 4-8
  - Thursdays 5:00-7:00
- Teams of Two Students

Design Project - Walker

- Design
- Build
- Program
- Details will be available later on the webpage



For a video, see
http://robotics.benedettelli.com/ResonantBiped.htm