Spring 2010 Rutgers School of Engineering Honors Seminar

Title: The Engineering Design of Home Automation

Instructor: Blase E. Ur, Senior Project Coordinator, Rutgers University School of Engineering

Tentative Time / Location: Fridays, 3:20 pm – 4:40pm in the Engineering building, Busch Campus.

Description: Imagine turning your home's lights on and lowering the blinds from your iPhone. We'll build a system from scratch that does exactly that. Smart homes, which use sensors and computer control systems to automate the control of lights, appliances, and home entertainment systems, have recently progressed from the realm of science fiction to a feasible design goal. In this seminar you will learn the basic principles of the engineering design process to design and build your own home automation system. You will learn about circuit design, build your own electrical systems, integrate sensors and servos into your design, and create user interfaces that control everything. Although the seminar will stress electrical, computer, and mechanical engineering concepts, we will have guest speakers augment our design with expertise from other disciplines. As a class, we'll develop a large scale home automation system, and each student will also build a smaller-scale prototype to keep.

Enrollment: The seminar will enroll a maximum of 15 students, with preference given to students in the School of Engineering Honors Program.

Credits: This is a not-for-credit course.

Registration Process: As this is a non-credit course, there will be an informal registration process. Email Blase directly ASAP (before January 10th) at blaseur at rci.rutgers.edu with a short description of why you'd like to enroll and what you hope to gain from the course.

Deliverables: As a class, we'll make a full-scale home automation system from scratch. You'll get to keep a small version (prototype) that implements part of the final design.

Books: Neither books nor other materials are required. It'll sometimes be helpful if you bring a laptop to class *if you already have one*.

Course Outline:

Week 1- We will research and evaluate existing home automation systems, and then define design parameters that will guide the rest of our process.

Week 2- This week will be an introduction to electronics and soldering. Students will build their own relays. We will also finalize our design parameters from the previous week.

Week 3- The third week will be an introduction to computer control systems. Using the Matlab programming language, students will build an interface to control one of the relays they built in the previous session. We will also discuss how to interface our control system with existing control systems in the house. Proposed guest speakers: electrical and mechanical engineering representatives

Week 4- Now that we have mastered the basics of a control system, we will discuss the "lo-fi" prototyping process and usability studies. Students will sketch and test their proposed interfaces. Students will then begin programming their user interface.

Week 5- The fifth week of the course will be spent integrating other sensors and outputs (i.e. microcontrollers, pressure sensors, and servos) into the students' existing system. Proposed guest speaker: Civil engineer

Weeks 6 and 7- The sixth and seventh weeks will be spent primarily building our prototype home automation system.

Week 8- Before we consider our prototype system complete, we will discuss and perform stress tests on the product. What are potential safety risks? How do we control them?

Week 9- Now that the product has been completed, we will discuss marketing strategies, the economics of production, and packaging. Proposed guest speakers: Business school professor and packaging engineering representative.

Week 10- In our final class, the students will give presentations to invited guests about their final designs, the evolution of their product, and their strategies moving forward.