University of California Santa Cruz
Computer Engineering

CE 8 – Robot Automation: Intelligence through Feedback Control Course Syllabus

Instructor

Prof. Bill Dunbar, E2 325, xt. 9-1031, dunbar@soe.ucsc.edu
Location/Time: E2 180, T H 12-1:45 PM
Office hours: H 10-12:00 PM

URLs

- Course web site: http://www.soe.ucsc.edu/classes/cmpe008/Fall07/.
- We will make extensive use of **web forum**: http://forums.soe.ucsc.edu/ for class assignments and discussions. Click on CMPE 8 for our course. Click on "Register" at the top right of the page to set up an account.

Course Description

Introduction to dynamical systems, feedback control, and robotics. Fundamental concepts in dynamical systems, modeling, stability analysis, robustness to uncertainty, feedback as it occurs naturally, and the design of feedback-control laws to engineer desirable static and dynamic response. Course includes an introduction to Matlab and programming in Matlab. Students will also learn about a robotic platform, its sensors, and eventually how to design and implement basic control logic to make robots autonomously track one another along a curved path.

Prerequisites

Enrollment is unrestricted. **NOTE**: This course is intended for first and second-year undergrads.

Grading

Homework: 10%, Participation: 5% Quizes: 25%, Midterm: 30%, Final: 30%.
Teams of 3 students will be responsible for a single robot. Some assignments (including parts of the homework and final) will be **team assignments**, and all members of the group will receive a *common grade*. I will not grade this course on a curve; therefore, it will not hurt you to help someone who has a lower grade than you. *Participation* is very important in this class (that's why it's 5% of your grade). The best way to ensure you get all 5% is to: 1) come to class on time and be prepared by having completed all assignments to that point, 2) volunteer for in-class exercises when they arise, and 3) play an active and cooperative role on your robot team.

Homework Policy

Assigned Thursday, due the following Tuesday. Collaborations are encouraged and feel free to consult anyone, particularly me and those in your team. However, all solutions handed in for credit must reflect your own understanding of the material.

Text

The course reader (a preprint of a book I am co-writing) is available in the bookstore.

Exams

In-class midterm and final exams will be given. For each team, a final presentation will also be required. More details on the desired presentation content is forthcoming.

Laboratory Sections

In your lab sections, you'll learn about the robot (Scribbler robot) used in the course (`http://www.scribblerrobot.com/`). The robot is simple to program, and comes capable of some very basic autonomous tasks. We will program the robots to follow one another (by "light" tracking) as an extension of their capabilities. Multi-robot coordination is currently an area of active research in the robotics, control and sensor network communities.

Course Outline

Week	Topic	Reference
1	Introduction to course	Chapter 1
2	Introduction to Matlab	Chapter 2
3	Discrete-time dynamics	Chapter 3
4	The logistic map and chaos	Chapter 3
5	Introduction to modeling and simulation	Chapter 4
6	Introduction to feedback control	Chapter 5
7	Robot: simulations and experiment	Chapter 6, handouts
8	Robot: line following and robot following control logic	handouts
9	Robot experiments	–

Final Advice: Come to my office hours.