CALIFORNIA INSTITUTE OF TECHNOLOGY

Control and Dynamical Systems

CDS 221 – Nonlinear Control

Course Outline

Instructor

Bill Dunbar, basement room 3 in Steele, dunbar@cds.caltech.edu
Location/Time: room 125 Steele, T H 1-3pm; Office hours: after class

Grading

Homework: 50%, Midterm: 30%, Final: 20%

Homework Policy

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

Text

Hassan K. Khalil, *Nonlinear Systems*, Maxwell Macmillan, 1992.
I go by the 2nd edition, so if you use the 3rd edition, you are responsible for mapping the material in order to read the appropriate material. A (multi-valued) map by chapters (that will be covered) from 2nd to 3rd edition is as follows: $(1, 2, 3, 11, 12) \rightarrow ((1, 2), 3, 4, 12, 13)$.

Exams

Midterm will be based material up to that point. Final will be one of two things: 1) equivalent to two homework sets, with problems taken from one chapter in Khalil not covered in the course, or 2) project with my consent, agreed upon by the end of April.

Course Outline

Week	Topic	Reference (2nd Edition)
1	Introduction, mathematical preliminaries	Ch.1 – §2.1
2	Properties of ordinary differential equations	§2.2 – §2.5
3	Lyapunov stability: autonomous systems	§3.1 – §3.3
4	Lyapunov stability: nonautonomous systems	§3.4 – §3.6
5	Basic feedback control, exact linearization	§11.1 – §11.2, §12.1 – §12.2
6	Exact feedback linearization, differential flatness	§12.2 – §12.4
7	Optimal control problem w/ global & local solutions	Handouts
8	NTG, receding horizon control	Handouts
9	Receding horizon control: centralized and distributed	Handouts
10	Overflow	