

Course Announcement for Fall 2009

Course number: ECE 586 DL

Course title: Hybrid Systems and Control

Instructor: Daniel Liberzon

Schedule: Tu Th 2–3:20pm, 57 Everitt Lab (*note: first class is Sep 1*)

Catalog description: Switched/hybrid systems are dynamical systems that combine continuous dynamics and discrete events. Such systems are of theoretical interest and important in many applications, and have attracted considerable attention in the recent control literature. This graduate-level course will introduce the students to basic techniques for analysis and design of switched and hybrid systems.

Prerequisites: The course will build on a standard first-year graduate course in state-space linear systems, such as ECE 515. Some knowledge of nonlinear system analysis techniques (such as those covered in ECE 517 or ECE 528) is a plus but not a requirement.

Text: D. Liberzon, *Switching in Systems and Control*, Birkhauser, Boston, MA, 2003.

Grading: The grades in this course will be determined based on a final project. There will be no exams.

Course outline:

I. Introduction

1. Definitions of switched and hybrid systems
2. Solutions to switched and hybrid systems
3. Examples

II. Stability analysis of switched systems

1. Common Lyapunov functions
2. Lie-algebraic stability criteria
3. Systems with special structure
4. Multiple Lyapunov functions
5. Slow switching

III. Hybrid control design

1. Stabilization by switching
2. Control of nonholonomic systems
3. Hybrid control of systems with limited information
4. Switching logics and supervisory control

IV. Final project presentations