

ECE 236 / ME 236: Nonlinear Control Systems

Winter 2004 , 4 credits

<i>Instructor:</i>	Prof. Andy Teel 5121 Eng. I 893-3616 teel@ece.ucsb.edu	<i>Lectures:</i>	TTh: 2 – 3:50 pm 1431 Phelps Hall
		<i>Office Hours:</i>	TTh: 4 – 5pm (or stop by...)
<i>Text:</i>	H.K. Khalil <i>Nonlinear Systems (3rd Ed.)</i> Prentice-Hall, 2002	<i>Grading:</i>	Final Exam 60 % Midterm Exam 40 %

COURSE TOPIC

Nonlinear *stability theory* (very little control; see ECE 237), with more emphasis on *discrete-time systems* (see supplemental notes) than in past years.

COURSE OUTLINE

1. Review of linear systems stability theory

Exponential stability, stability, detectability, dissipativity, interconnections, Lyapunov functions, converse Lyapunov theorems. *Supplemental notes & various locations in Khalil.*

2. Characteristics of nonlinear dynamics compared to linear dynamics

Multiple isolated equilibria, limit cycles, finite escape time, existence / uniqueness / continuous dependence of solutions, stability boundaries. *Khalil ch. 1-3 & Supplemental notes.*

3. Qualitative analysis in the neighborhood of equilibria

Stability definitions, Lyapunov theory, center manifold theory, invariance theorems. *Khalil chapters 4 & 8.*

4. Stability under perturbations

Input to state / output stability properties, absolute stability, interconnected systems, nonlinear small gain theorem, passivity, averaging, singular perturbations. *Khalil ch. 5-7,9-11.*

PREREQUISITES

Some knowledge of Linear Systems (ECE 230A /ME 243A) assumed.

SUPPLEMENTAL NOTES

Available at <http://www-ccec.ece.ucsb.edu/people/teel/236/>