NYU Tandon School of Engineering – Polytechnic Institute
Department of Electrical and Computer Engineering

EL8223: Applied Nonlinear Control

Instructor: Prof. Farshad Khorrami, LC266E, khorrami@nyu.edu
Office Hours: See website
Course Website: http://crrl.poly.edu/8223

Course Outline

1: Motivation, examples, linearization, and Lie derivatives.

2,3: Lie Algebra and Lie bracket (and properties), vector fields, distributions, diffeomorphisms, and examples.

4: Frobenius Theorem and applications.

5,6: Local decomposition of control systems: review of Kalman decomposition, controllability and observability Lie Algebras, and local decompositions.

7: Relative degree, input-output linearization, zero dynamics, minimum and non-minimum phase.

8: Midterm.

9,10: Exact feedback linearization, stabilization, and examples.

11: Asymptotic output tracking, disturbance decoupling, model matching, canonical forms, and observers.

12: Lyapunov stability, control Lyapunov functions (CLF), advanced stability analysis, and passivity.

13: Input-state stability (ISS) and small gain results.

14: Backstepping and variations.

15: Final.

References:
1. Lecture notes on the course website.
2. A. Isidori, Nonlinear Control Systems, Springer-Verlag, 1995.
3. H. K. Khalil, Nonlinear Systems, Prentice Hall, 2001.
4. S. Sastry and M. Bodson, Adaptive Control: Stability, convergence, and robustness, Dover Publications, 2011.
5. S. Sastry, Nonlinear Systems: Analysis, Stability, and Control, Springer, 1999.
Grading:
Midterm: 35% , Final: 40% , Homework: 10% , Project - 15%