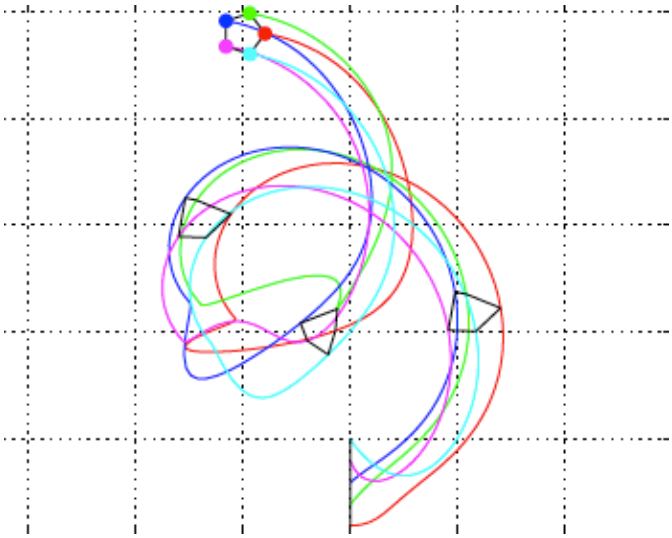

Topics Courses for Winter 2017, Spring 2017: Networked Control Systems I and II

MTH 610, 610 (3 credits, 3 credits).

Description: We will cover topics from networked systems theory, a very active area of research in control theory during the last decade, at the intersection of graph theory and dynamical systems. The emergence of cheap sensors and mechanical systems capable of short-range communications and local decision-making has raised a number of control systems questions regarding decentralized control approaches.

These systems, called networked dynamical systems, are modeled as graphs with a dynamical system at each node. Those dynamical systems communicate and interact with each other via the arcs of the graph and the goal is to study the collective behavior resulting from such communication and interactions.

The courses will focus on three main issues: (1) network models (graphs, switching networks), (2) Decentralized Control (communications and control resources in a networked system), and (3) Multi-agent systems (consensus, formation control).

Prerequisites: The preferred prerequisite is Mth 477/577 (Mathematical Control Theory). However, any of the engineering control courses (ME 552, 553, ECE 551, 552) would be more than adequate. Students without control systems background but with sufficient mathematical maturity from courses in differential equations are welcome.

Textbook(s): The course will draw from two main texts: Graph Theoretic Methods in Multiagents networks, by *Mehran Mesbahi and Magnus Egerstedt* and *Distributed Control of Robotic Networks: A Mathematical Approach to Motion Coordination Algorithms,* by *Francesco Bullo, Jorge Cortés, and Sonia Martínez.*

Place in the curriculum: The course will count towards the 600-level requirements for the MS in mathematics, and for the PhD program in Mathematical Sciences.

Instructor: Prof. Gerardo Lafferriere