

EE 974 NETWORKED AND EMBEDDED CONTROL SYSTEMS

Total Credits: 03

Lecture/Recitation/Discussion Hours: (3-0)

Course objective:

This course will expose the students to the (rapidly developing) area of networked and embedded control systems. This includes basic theory, tools, and results in stability analysis, fundamental limits on achievable performance, and controller design. The course will also cover various approaches to the control of large networks of mobile nodes (swarms), many inspired by phenomena in biology or physics.

Course topics/outline:

1. Motivating applications
2. Fundamentals in hardware, software, and networking
3. Theory on networked and embedded control systems
4. Hybrid systems and control
5. Temporal logic for model checking and controller synthesis
6. Switched systems
7. Control with communication constraints
8. Quantization, bit rate, and performance
9. Multi-agent coordination and control
10. Methods based on graph theory and matrix analysis
11. Methods based on geometric optimization and non-smooth analysis
12. Methods based on Lie groups and symmetry
13. Methods based on Markov random fields

Prerequisite:

Dynamic Systems Theory

Textbook:

D. Hristu-Varsakelis and W. S. Levine (eds.), *Handbook of Networked and Embedded Control Systems*, Birkhauser, Boston, 2005