SE733/EC733/ME733: DISCRETE EVENT AND HYBRID SYSTEMS

SPRING 2020

(4 credits)

http://people.bu.edu/cgc/se733

Professor Christos G. Cassandras

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• Organization: Lectures: M,W 12:20-2:05PM, EMB 105

• Prerequisites: EK 500 or equivalent; SE501 or equivalent

• Requirements:

1. Homework Assignments and Class Presentations 30%

2. Course project and report 70%

• Objectives:

1. Learn about Discrete Event Systems (DES) as well as Hybrid Systems (HS) that combine both continuous (time-driven) and discrete (event-driven) dynamics and about their applications in many different domains (multi-agent systems, Cyber-Physical Systems, communication and sensor networks, manufacturing, transportation, etc).

2. Learn about data-driven methodologies for the control and optimization of these systems, capitalizing on the proliferation of “big data” availability.
3. Develop the ability to conceptualize cutting-edge issues in the DES and HS domain, and formulate problems for potential research purposes.

**Office Hours:** Monday, 2:15-3:15pm.


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**COURSE OUTLINE**

1. Review of system theory fundamentals
2. Untimed DES Models: Automata, Petri Nets
3. Timed Models: Timed Automata, Timed Petri Nets, max-plus algebra models
4. Monte Carlo computer simulation: principles, pitfalls, applications using commercial software tools (e.g., SimEvents see [http://www.mathworks.com/products/simevents/](http://www.mathworks.com/products/simevents/))
5. Stochastic models, queueing theory
6. Markov Decision Process theory
7. Perturbation Analysis and Rapid Learning methods
9. Introduction to the analysis and control of Hybrid Systems

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**ADDITIONAL REFERENCES**


• **State-of-the art papers to be handed out in class**