EE/ISE 556: Stochastic Systems

Lecture Time: 12:30-1:50pm on Tuesdays and Thursdays;
*Location:*TBD; *Office Hours:* Tue. 2-3pm; Thu. 2-4pm
Instructor: Ashutosh Nayyar, EEB 326, (213)740-2353
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Course Description:

This course will focus on control of stochastic systems. The emphasis will be on discrete-time stochastic control theory, and depending on time, some continuous-time stochastic control may be covered. It will cover topics including controlled Markov chain models, stochastic dynamic programming, estimation and control for linear systems, infinite-horizon dynamic programming, multi-armed bandit problems and some reinforcement learning methods.

The course is intended for MS and PhD students in Controls, Networks, Communications and Signal Processing Areas of Electrical Engineering. It should also be of interest to students in Industrial and Systems Engineering and Computer Science.

Pre-requisites:

Students are expected to be familiar with probability theory at the level of EE 503. EE 512/562 are recommended preparation. Please contact the instructor for D-clearance. The course evaluation will be through class participation, home works, a midterm and a final exam and/or a project (depending on class size).

Grading (Tentative): (Mid-term + Final) Exam (50%), Home-works (15%), Project (30%), Class Participation (5%).

Text:

P. R. Kumar and P. Varaiya, Stochastic Systems, 1986

Additional References:

D. Bertsekas, Dynamic Programming and Optimal Control (Vol. I & II), 3rd ed., 2007
K. Astrom, Introduction to Stochastic Control Theory, 1970
M. Puterman, Markov Decision Processes, 1994

Projects: Projects may involve reading two or more papers and writing a critical summary explaining the problem setup, analytical approach and the results of the papers. Alternatively, students can use the control and learning algorithms discussed in the course to numerically solve variants of problems discussed in some research papers. The work done will be presented in a project presentation in the last week of classes.

Statement on Academic Conduct and Support Systems

Academic Conduct

Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Section 11, *Behavior Violating University Standards*https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions/. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct/.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the *Office of Equity and Diversity* http://equity.usc.edu/ or to the *Department of Public Safety* http://capsnet.usc.edu/department/department-public-safety/online-forms/contact-us. This is important for the safety whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. *The Center for Women and Men* http://www.usc.edu/student-affairs/cwm/ provides 24/7 confidential support, and the sexual assault resource center webpage sarc@usc.edu describes reporting options and other resources.

Support Systems

A number of USC's schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the *American Language Institute* http://dornsife.usc.edu/ali, which sponsors courses and workshops specifically for international graduate students. *The Office of Disability Services and Programs* http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.htmlprovides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, *USC Emergency Information* http://emergency.usc.edu/will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.