Autumn 2018 Syllabus

EEP 547 Linear Systems Theory

Tuesdays 6:00pm - 9:50pm, EEB 003

Lecture (6:00pm - 8:00pm)
Lab (8:00pm - 9:50pm)

Instructor: Professor Linda Bushnell LB2@uw.edu
office hours: Tuesdays 4:00-5:00pm, EEB M342, or email me

TA: Sang Sagong, sagong@uw.edu
TA office hours: Tuesdays 5:00-6:00pm in EEB 026 and Saturdays 1:30-3:30pm room EEB 431

Textbooks & Software:

- J. Hespanha, "Linear Systems Theory," Princeton University Press, 2nd edition (recommended)
- P. Antsaklis and A. Michel, "A Linear Systems Primer," available at https://www.springer.com/gb/book/9780817644604 (should be free with uw email)
- Matlab, Simulink, Control Systems Toolbox, Symbolic Math Toolbox (buy student version through UW, or use remote UW version)
- Minseg robot based on Arduino (UW will provide this to each student for the quarter)

Other Reference Books:
1. P. J. Antsaklis and A. N. Michel, Linear Systems, McGraw Hill, 1997.
2. W. J. Rugh, Linear System Theory, Prentice Hall, 1993.
3. T. Kailath, Linear Systems, Prentice Hall, 1980.
4. C.T. Chen, Linear System Theory and Design, 3rd Ed, Oxford, 1999.

Grading:
Homework 40% (late submission policy: -0.2points per day, 0 point will be given if the homework is submitted after the solution is uploaded)
Midterm 20% (take home)
Project 40% (project report and presentation (Dec 4th); no late reports accepted; robot kits to be returned last day of class, Tuesday, December 4th)
No final exam (class ends Dec 4th with the project presentations)

Topics Covered:

- System Representation: modeling, transfer function, state space, linearization, causality, time invariance, linearization

- System Response: LTV and LTI systems, impulse response, step response, frequency response, Bode Plots
- Stability: Lyapunov, Input-Output
- Controllability: concept of controllability, controllable subspaces, decompositions
- Observability: concept of observability, output feedback, minimal realizations
- State-variable Feedback from state space model
- State Observers from state space model
- Review of PID controller via transfer function model
- Brief introduction to LQR controllers from state space model
- Use of Matlab and Simulink to explore concepts covered above.
- Implementation of above concepts on a MinSeg robot.