Linear System Theory (ECE532)

Spring 2018

This is a fundamental graduate level course on modern dynamical systems and control theory. We focus on state-space techniques to design and analyze dynamic control systems. Some familiarity of linear algebra, ordinary differential equations, and programming skills (e.g. MATLAB) is recommended, although the necessary mathematical skills will be covered during the lectures.

- **Class Schedule: Mon, Wed, 13:00-14:15, 106-711**
- **Instructor: Jun Moon (junmoony@unist.ac.kr), 106, 701-3**
- Course website: UNIST Blackboard
  - HWs and course announcements will be posted on the course website.
- Textbook: Chi-Tsong Chen, *Linear System Theory*, 4th edition, Oxford University Press, available at the UNIST bookstore
- Grading Policy: HW(50%), Midterm(20%), Final Exam (30%)
  - Grading is based on the total score
    * A+: score ≥ 95
    * A: $90 \leq$ score < 95
    * A-: $80 \leq$ score < 90
    * B+: $75 \leq$ score < 80
    * B: $65 \leq$ score < 75
    * B-: $60 \leq$ score < 65
    * C+: $55 \leq$ score < 60
    * F: score < 55
  - Note that if you don't submit more than two homework assignments, you will get F.

Course Policy

- There will be one midterm and one final exam.
- There will be 7-10 homework assignments.
- HW must be written via LaTeX. The hand-written HW will NOT be accepted.
- Collaboration on the homework is permitted, however each student must write and submit independent solutions. Homework is due within the first 5 minutes of the class period on the due date.
- No late homework will be accepted (unless an extension is granted in advance by the instructor).

References

1. G. Strang, *Linear Algebra and Its Applications*
2. G.F. Franklin, *Feedback Control of Dynamic Systems*
3. William L. Brogan, *Modern Control Theory*, 3rd edition, Prentice Hall
4. W. J. Rugh, *Linear System Theory*, 2nd edition, Prentice Hall

5. R. W. Brockett, *Finite Dimensional Linear Systems*, Wiley
6. J. P. Hespanha, *Linear System Theory*, Princeton University Press

Tentative Course Topics

- Introduction to control (state space, control applications)
- Linear algebra, (linear and nonlinear) ordinary differential equations, state-space models
- Lyapunov stability
- Controllability, observability, Kalman decomposition
- State-feedback, pole-placement, output feedback (observer)
- Linear-quadratic optimal control, Kalman filtering, and digital control (as time permits)
- Robust control and differential games (as time permits)