# ME446.632 Control Systems I
# Mechanical Engineering@SNU Spring 2017

**Instructor:** Prof. Dongjun Lee (office) 301-1517 (e-mail) djlee@snu.ac.kr (p) 02-880-1724

**Class Schedule:** M/W 5:00-6:15pm @ 301-305

**Office Hours:** M/W 11:00am-12:00pm with appointment

**TA:** Nguyen Hai-Nguyen (lead TA) (office) 301-211 (e-mail) hainguyen@snu.ac.kr (p) 02-880-1690
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**Textbooks:**

Feedback Control Theory, J. Doyle, B. Francis & A. Tannenbaum, Dover, 2008
Linear System Theory and Design, C-T. Chen, Oxford University Press, 1998
Control System Design: An Introduction to State-Space Methods, B. Friedland, Dover, 2005

**References:**

Control System Design, G. C. Goodwin, S. F. Graebe & M. E. Salgado, Prentice Hall, 2000
Modern Control Systems, R. C. Dorf & R. H. Bishop, Prentice Hall, 2008
Linear System Theory, W. J. Rugh & T. Kailath, Prentice -Hall
Multivariable Feedback Control, S. Skogestad & I. Postlethwaite, John Willey & Sons
Applied Nonlinear Control, Slotine and Li, Prentice-Hall, 1991
Principles of Robot Motion, H. Choset et al, MIT Press, 2004

**Course Description:** This is the first graduate course on dynamic systems and control. This course will mainly deal with analysis and control design techniques for linear control systems. Three main pillars of the course are: 1) frequency domain techniques for linear systems; 2) time-domain state-spate techniques for linear dynamical systems; and 3) optimal quadratic control and optimal state estimation of linear systems. Main topics of the course in this semester are:

Robust stability and robust performance
Loop shaping: performance vs robustness
Control synthesis constraints and model matching
Linear dynamical system: stability and solution
Controllability, observability, and separation principle
State-space control design techniques
Linear quadratic control (LQR)
Kalman estimation
Kalman filtering (if time permits)

**Prerequisites:** Undergraduate-level classical control courses or equivalent; or by the consent of instructor

**Grading:** homework (20%) mid-term (40%) 4/19 7-9:30pm final exam (40%) 6/14 7-10pm

**Homework:** Homework should be turned in at the beginning of the lecture on the due date. If turned in late on the same day, 50% will be deduced. Otherwise, it will get zero point. Each problem of homework will be graded in the scale of 0/0.5/1 from 0-1 scale.

**Students conduct:** students are expected to behave professionally in this class: going-in/out during the class, newspaper reading, phone call, texting, or any other unprofessional behaviors are not allowed.

**Academic integrity:** any academic dishonesty is strictly prohibited in this class, and, if caught, can result in F-grade and academic disciplinary actions.