KOM3712 Control Systems Design

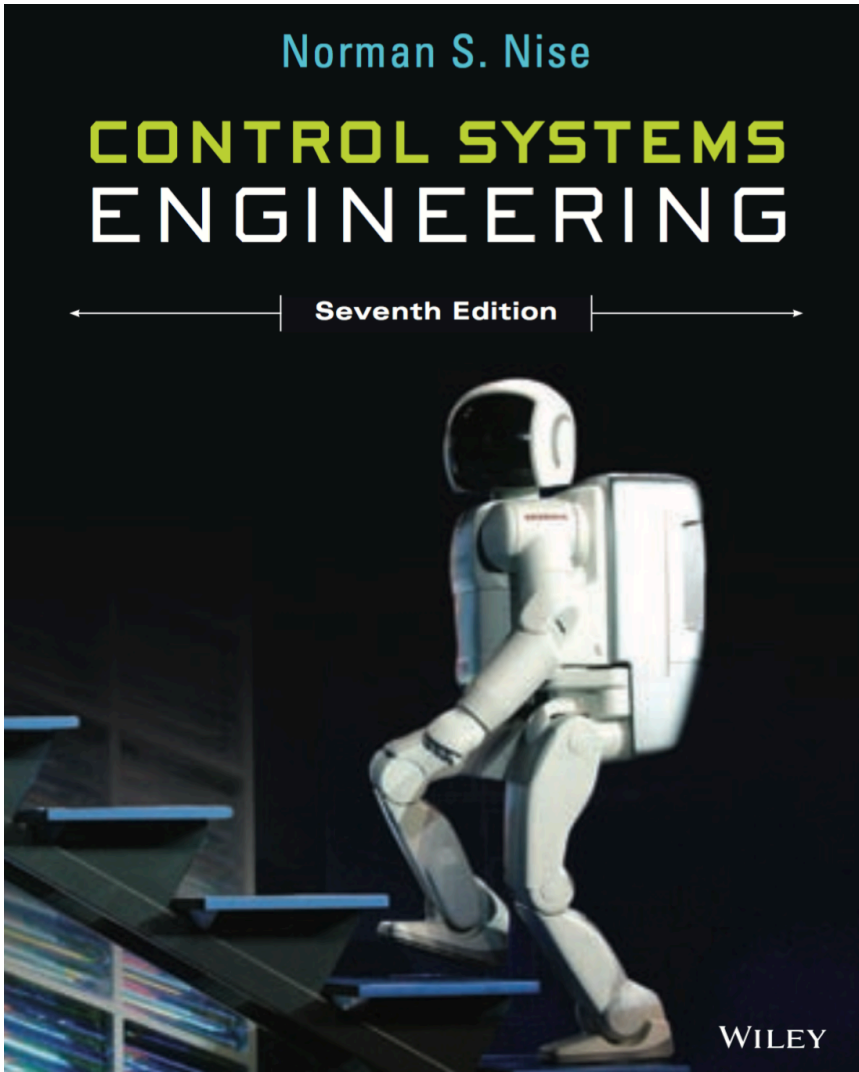
Spring 2021

Main textbook:

- **Control Systems Engineering 7th Edition, Norman S. Nise**

Additional notes from the textbooks:

- Feedback Control of Dynamic Systems, Franklin et al., 6th ed., P. Hall, NJ, 2010
- Modern Control Engineering, K. Ogata, 5th edition, Prentice Hall, NJ, 2010
- Feedback systems: an introduction for scientists and engineers, K.J. Åström and R.M. Murray *available at* http://www.cds.caltech.edu/~murray/amwiki/index.php/Second_Edition
- other sources including internet sites.



Instructor: : Dr. Şeref Naci Engin, Professor

Teaching Assistant : Ms. Buse Tacal Ucun, MSc

Office Hours : Upon appointment

Grading : 60% (term) + 40% (final)

- Midterm exam : 1 x 20%
- Assignments : 2 x 20%
- Quizzes : 2 x 20%
- Final exam : 40%

No makeup exam unless submitting official proofs!

Only individual submissions allowed!

Syllabus for

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Chapter-10 Frequency Response Techniques:

- Intro. to Frequency Response Methods
- Bode Diagrams
- Steady-State Error Characteristics from Bode Magnitude Plots
- Nyquist Stability Criterion
- Gain and Phase Margins
- Bandwidth, Response Speed, Resonant Peak, etc.
- Constant M Circles and Constant N Circles
- Nichols chart
- Damping Ratio from Phase Margin
- Response Speed from Open-Loop Frequency Response
- Systems with Time Delay
- Obtaining Transfer Functions Experimentally

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Chapter-11 Design via Frequency Response:

- Gain adjustment to meet a transient response specification
- Lag Compensator design to improve the steady-state response
- Lead Compensator Design to improve the transient response
- Lag-Lead Compensator Design to improve both the steady-state and the transient response
- PI, PD & PID Controller Design as alternative to phase compens.
- Special Topics: Sensitivity functions, Loop-shaping, Robustness

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Chapter-12 Design via State Space Methods:

- Canonical Forms & Pole Placement
- Observers
- Integral Control
- Example applications for Observers with Integral Control
- Intro. to Optimization and Linear Quadratic Regulator (LQR)