Course name	**ECE 38200 Feedback System Analysis and Design**
Credit and contact hours	(3 cr.) Class 3
Course coordinator's name	Lingxi Li
Textbook	R. C. Dorf and R. H. Bishop, *Modern Control Systems*, 13th Edition. Pearson Education, 2017. ISBN-13: 9780134407623
Course information	ECE 38200 Feedback System Analysis and Design (3 cr.) P: ECE 30100. Class 3. Classical concepts of feedback system analysis and associated compensation techniques. In particular, the root locus, Bode diagram, and Nyquist criterion are used as determinants of stability. **Prerequisites/ Co-Requisite** P: ECE 30100 (or ME 33000 or equivalent for ME Majors). **Required, Elective, or Selected Elective:** EE Required, CE Elective
Goals for the course	Upon successful completion of the course, students should be able to 1. Derive and use mathematical models of simple electrical and mechanical systems. [1] 2. Obtain block diagrams and signal flow graphs of system interconnections. [1] 3. Perform analyses for transient and steady-state responses, stability and sensitivity of linear time-invariant systems. [1, 2, 6] 4. Design controllers to meet specifications and requirements in both the time domain and frequency domain. [1, 2, 6] 5. Use computer-aided tools such as Matlab/Simulink for control system analysis and design. [1, 2, 6]
List of topics to be covered	1. Mathematical models: differential equations and linear approximations (2 classes) 2. Mathematical models: transfer functions, block diagrams, and signal flow graphs (3 classes) 3. Feedback control system characteristics: open vs. closed loop, parameter sensitivity (2 classes) 4. Performance analysis: performance indices and criteria, transient response, steady-state errors (2 classes) 5. Stability analysis using the Routh-Hurwitz criterion (2 classes) 6. Analysis and design using root locus methods (2 classes) 7. Frequency response of second-order systems (1 class) 8. Frequency response methods: Bode diagrams (2 classes) 9. Stability analysis using the Nyquist criterion (2 classes)

	10. Controller design: Lead/lag compensators (2 classes) 11. Controller design: PID controllers (2 classes) 12. Introduction to robustness (1 class) 13. Introduction to state-space analysis and design methods (4 classes) 14. Review and exams (3 classes)
Syllabi approved by	Lingxi Li
Date of approval	10/23/2021