332: 417 Concepts of Control Design – Fall 2009

Instructor: Professor Zoran Gajic, ELE 222, tel. 5-3415, <u>gajic@ece.rutgers.edu</u> Assistant Instructor: Mr. Thang Nguyen, ELE 202, tel: 5-5015, <u>thnguyen@eden.rutgers.edu</u> Textbook: Z. Gajic and M. Lelic, *Modern Control Systems Engineering*, Prentice Hall, London, 1996.* Office Hours: Tu, F 1:20-2:30 pm. Class Home Page: <u>http://www.ece.rutgers.edu/~gajic/417.html</u>

TOPICS:

Review of Feedback Properties (Sections 12.1-12.3 from Linear Dynamic Systems and Signals textbook) Quiz 1 (Prerequisite Quiz) (2% of the course grade, F Sept 11) State Space Approach (Chapter 3) System Linearization (Chapter 1: Section 1.6, also Section 8.6 in Linear Systems and Signals textbook) Control of Nonlinear Systems via Linearization (Class Notes). Project #1 assigned. Introduction to MATLAB/Simulink (Appendices C&D from Linear Systems and Signals textbook) Quiz 2 (2% of the course grade, F Sept. 25) Transfer Function Approach (Chapter 2) Quiz 3 (1% of the course grade, F. Oct. 9) EXAM I, Middle of October, 12:00-1:20 pm, SEC 206 (30% of the course grade) Controllability and Observability Concepts and Observer Design (Chapter 5) Ouiz 4 (2% of the course grade, F Oct. 30) Controller Design via Pole Placement (Section 8.2). Project #2 assigned. Stability Concept and Stability Robustness Margins (Chapter 4) Ouiz 5 (1% of the course grade, F Nov. 6) Control System Design Specifications (Chapter 6) EXAM II, Middle of November, 12:00-1:20 pm (30% of the course grade) Design of Controllers via Root Locus (Chapter 8) Quiz 6 (1% of the course grade, F Nov. 20) Design of Controllers via Bode Diagrams (Chapter 9). Project #3 assigned.

Quiz 7 (1% of the course grade, F Dec. 4) Optimality Concept and Design of Optimal Controllers (Chapter 10) Stochastic Systems and Design of Optimal Kalman Filter (Chapter 10) Design (Tuning) of PID Controllers (Class Notes)

Grading: $A \ge 90$, $B^+ \ge 82$, $B \ge 75$, $C^+ \ge 67$, $C \ge 60$, $D \ge 50$ MATLAB/Simulink Projects = 30%; EXAM I = 30%; EXAM II = 30%; Quizzes = 10%.

Sakai: Exam results, project assignments and results, and homework solutions will be posted on Sakai's website.

* The textbook is currently out of print. It will be available on the web. Some lectures (ppt- and pdf-slides) and some chapters (pdf files) can be downloaded from the class website <u>http://www.ece.rutgers.edu/~gajic/417.html</u>

Homework Problems:

Chapter 1: 5, 6, 7, 8, 9, 10, 11, 12 (8) Chapter 2: 1a,b,c, 3, 9, 10, 12, 13, 14, 16, 17 (9) Chapter 3: 1, 2, 3, 4, 5, 7 and 8.6 from *Linear Dynamic Systems and Signals* (7) Chapter 4: 1, 2, 3, 4, 7, 8, 11, 14, 16, 17, 18, 24, 25 (11) Chapter 5: 1, 2, 3, 5, 6, 7, 9, 10, 14 (9) Chapter 6: 3, 4, 5, 6, 7, 8, 9 (6) Section 8.2: 1, 2 (2)