332:505 Control Theory I – Spring 2007

Instructor: Verica Gajic, ELE 204, tel: 445-5015, email: vericag@ece.rutgers.edu
Office hours: W 5:30-6:30pm.

Textbook: ***C-T. Chen***, ***Linear System Theory and Design***, 3rd edition, Oxford University Press, 1999. (**C99**). Some lectures will be supplemented from the 2nd edition of the same textbook (**C84)** (stability of time-varying linear systems, **C84** Chapter 7; and controllability/observability of linear time-varying systems, **C84** Chapter 5) and textbooks
Z. Gajic and M. Lelic, *Modern Control Systems Theory*, Prentice Hall, 1996, (**GL96** Chapter 5: Introduction to controllability and observability, Chapter 10 Introduction to optimal control) and
K. Zhou and J. Doyle, *Essentials of Robust Control*, Prentice Hall, 1998, (**ZD98** Chapter 2: Linear algebra, and Chapter 7: Linear system order-reduction via the balancing transformation)
All supplemental material will be provided to students.

Class Home Page: http://www.ece.rutgers.edu/~gajic/505.html

Course Outline:

Week 1: Course Overview. Introduction to Linear Systems (**C99** Chapter 1, Sections 2.1-2.3)
Week 2: Modeling and Linearization of Nonlinear Systems (**C99** Sections 2.4-2.5)
Discrete-time Linear Systems (**C99** Section 2.6)
Week 3: Introduction to Linear Algebra (**C99** Chapter 3, **ZD98** Chapter 2)
Week 4: State Space (**C99** Chapter 4)
Week 5: Stability of Linear Dynamic Systems (**C99** Chapter 5)
Week 6: Lyapunov Stability and Stability of Linear Time Varying Systems
(**C99** Chapter 5 and **C84** Chapter 7)
Week 7: Introduction to Controllability and Observability (**GL96**, Chapter 5)
Week 8: MIDTERM EXAM
Week 9: Controllability and Observability Basic Theorems (**C99** Chapter 6)
Week 10: Additional Theorems on Controllability and Observability
(**C99** Chapter 6, **C84** Chapter 5, **ZD98** Section 3.2)
Week 11: System Model Order-Reduction via the Balanced Transformation
(**ZD98**, Chapter 7, **C99** Chapter 7)
Week 12: State Feedback and State Estimators (**C99** Chapter 8)
Week 13: Reduced-order State Estimators (**C99** Chapter 8)
Week 14: Pole Placement and Introduction to Optimal Control
(**C99** Chapter 9 and **GL96** Chapter 10)

Homework will be assigned weekly with the solutions distributed a week later. Exams will be based on problems similar to homework and theoretical questions covered in class.

Grading:
Midterm Exam 40%
Project using MATLAB 20%
Final Exam 40%