

**University of Massachusetts
Department of Electrical &
Computer Engineering
Amherst, MA 01003**

Course Instructor: **R. Janaswamy**
Date of Outline Preparation: **09/01/2013**
Prepared by: **R. Janaswamy**

ECE 604: Linear Systems Theory (3-0), Fall 2013

1. Catalog Data:

Linear dynamical systems and state variables; difference and differential equations; vectors and vector spaces, linear independence and bases, rank and degeneracy, linear operators, eigenvalues, eigenvectors; linear functionals, matrix functions, quadratic form, Jordan form; Liapunov functions and stability; solutions to state equations.

2. Course Objective:

The objective of the course is to give the student an understanding of the characterization and design of a linear dynamic system through state variable approach.

3. Text and References:

Text: *Linear System Theory*, Wilson J. Rugh. Prentice-Hall, 1996, ISBN: 0-13-441205-2.

Ref: *Introduction to Dynamic Systems*, David G. Luenberger. John Wiley & Sons, 1979, ISBN: 0-471-02594-1.

4. Required Background Experience:

1. Matrix theory and linear algebra.
2. Ordinary differential equations.
3. Transform methods.

5. Detailed Description of the Course

A. Mathematical Notation and Review: Ch 1	4 lecs
B. State Equation Representation: Ch. 2	3 lecs
C. State Equation Solution: Ch. 3	3 lecs
D. Transition Matrix Properties: Ch. 4	3 lecs

E. LTI and Periodic Cases: Ch 5	3 lecs
F. Stability and Lyapunov Criteria: Chs 6-8	6 lecs
G. Controllability and Observability: Ch 9	5 lecs
H. Realizability: Ch 10	4 lecs
I. Input-Output Stability: Ch 12	3 lecs
J. Controller and Observer Forms: Ch 13	4 lecs
K. No Classes (10/14, 11/11, 11/29)	2 lecs
L. Monday Schedule (Tuesday 10/15)	1 lec
TOTAL	41 lecs

6. Method of Instruction and Evaluation

A lecture mode of instruction will be used. One midterm (40%, Monday 10/21, 7:00-9:00 pm) and one final exam (40%) are planned for the course. Homeworks will be assigned periodically and carry 20% of grade. No late homeworks will be entertained.

7. Computer Usage:

Familiarity with MATLAB is desirable.

8. Lecture Room:

MRST 15, MWF 1:25-2:15 pm

9. Office Hours:

Tu: 11:00-1:00 pm, Marcus 215 Conference Room.

10. Course Website:

<http://www.ecs.umass.edu/ece/janaswamy/ece604/>