

**Polytechnic University of Puerto Rico
Department of Electrical Engineering
Master in Electrical Engineering**

Course Syllabus

Course Title : Linear Systems

Course Code : [EE 6030](#)

Credits : Three (3) credits

Duration : One academic trimester

Schedule : Forty-five credit hours per course

Prerequisites : [EE 6010](#): Mathematical Methods for Signal Processing as [co-requisite](#).

Course Description

Review of linear algebra; vector spaces and operators. Mathematical descriptions of linear systems; controllability and observability, irreducible realization of rational transfer-function matrices; canonical forms, state feedback, and state estimators; stability.

Justification

This is a fundamental entry-level graduate course within the MSEE program. It provides a rigorous mathematical foundation in linear algebra, linear spaces and operator concepts necessary to successfully meet study and research demands within the graduate program. Concepts will be re-enforced using computer-aided engineering tools like MATLAB®, SIMULINK®, as well as others.

Objectives

Provide entry-level graduate students with a rigorous, comprehensive introduction to Linear Systems.

Textbook

Fundamentals of Linear State Space Systems (1999)

By John S. Bay

McGraw-Hill

ISBN: 0-256-24639-4

Course Outline

Topics Covered

1. Review of Linear Algebra Concepts:
 - a. Models of Linear Systems
 - b. Vectors and Vector Spaces
 - c. Linear Operators on Vector Spaces
 - d. Eigenvalues and Eigenvectors
 - e. Functions of Vectors and Matrices
2. Solutions to State Equations
3. System Stability
4. Controllability and Observability
5. System Realizations
6. State Feedback and Observers

Computer Usage:

There will be assignments every week with the purpose of using computer-aided engineering programs like MATLAB, SIMULINK, etc.

Evaluation Criteria

Final course grade will be determined based on the following scale:

100-90	A
89-80	B
79-70	C
69-60	D
59- 0	F

Course History

April 30, 2002: prepared by Jose Riollano, M.S.E.E, P.E.

May 1, 2002: revised by Pedro Torres, Ph. D., P.E.

Jan, 2008: revised by Marvi Teixeira, Ph.D.,P.E.

Apr., 2008: revised by Marvi Teixeira, Ph.D., P.E.

Bibliography

Linear Systems (2006)

By Panos J. Antsaklis and Anthony N. Michel

1st Edition, 2nd Printing

Birkhauser

ISBN: 0-8176-4434-2

Linear Systems and Signals (2002)

By B. P. Lathi
1st Edition
Oxford
ISBN: 0-19-515129-1

Linear System Theory and Design (1998)
Chi-Tsong Chen
3rd Edition
CBS College Publishing
ISBN: 0195117778

Linear Systems (1997)
By Panos J. Antsaklis & Anthony N. Michel
McGraw-Hill
ISBN: 0-07-041433-5

Linear System Theory, 2/E (1996)
Wilson J. Rugh
Prentice-Hall
ISBN: 0-13-441205-2

Linear Systems (1980)
Thomas Kailath
Prentice-Hall
ISBN: 0-13-536961-4