

Syllabus

Course #: MATH 695

Title: *Semi-group Theory and application to Stability*

Textbook: Semi-groups associated with dissipative systems by Zhuangyi Liu and Songmu Zheng, Chapman & Hall/CRC 1999

References

- 1) A. Pazy, Semi-groups of linear operators and application to PDE, Appl. Math. Sci. 44, Springer, (1983).
- 2) V. Komornik, Exact Controllability and Stabilization. The Multiplier Method, Masson-John Wiley, Paris (1994)

Prerequisite Math 569

Objectives: This course is intended to introduce students to theory of stability and prepare them to tackle some real-World problems

Outcomes: By the end of the course, the students should

- 1) Know how to use some semi-group techniques to establish existence
- 2) Know how to use some semi-group techniques to establish stability for some linear dissipative problems such as wave systems, viscoelasticity, and thermo-elasticity
- 3) Have a vision to future research

Week #	Chapter	Section
1	Chapter 1: Preliminaries	1.1 Basic Definitions
		1.2 C_0 -semigroup Generated by Dissipative Operator
		1.3 Exponential Stability and Analyticity
2	Chapter 2: Linear Thermo-elastic Systems	2.1 The Setting of Problems for the One-Dimensional Thermo-elastic Systems
3		2.2 The Exponential Stability for the Dirichlet-Boundary Conditions at Both Ends
4		2.3 The Exponential Stability for the Stress-Free Boundary Conditions at Both Ends
5-6		2.4 The Exponential Stability for the Stress-Free Boundary Conditions at One End
		2.5 The Thermo-elastic Kirchhoff Plate Equations
7	Chapter 3: Linear Viscoelastic Systems	3.1. Linear Viscoelastic System
8-9		3.2 Wave Equation with Locally Distributed Damping
		3.3 Linear Viscoelastic System with Memory
10		3.4 The Linear Viscoelastic Kirchhoff Plate with Memory
11	Chapter 4: Linear Thermo-viscoelastic Systems	4.1 Linear One-Dimensional Thermo-viscoelastic System
12		4.2 Linear Three-Dimensional Thermo-viscoelastic System with Memory
13	Chapter 6 Linear Elastic Systems with Boundary Damping	6.1 Second-Order Hyperbolic Equation
14		6.2 Euler-Bernoulli Beam Equation
15		Catch up

Assessment: Some Homework problems and presentations.

Remarks: The hard copy as well as the electronic version of the book are available
This is a total new course. It has 0% overlapping with any existing course

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