

Contents

Preface to the Second Printing	v
Preface to the First Printing	vii
Chapter 1	
Generation and Representation	1
1.1 Uniformly Continuous Semigroups of Bounded Linear Operators	1
1.2 Strongly Continuous Semigroups of Bounded Linear Operators	4
1.3 The Hille-Yosida Theorem	8
1.4 The Lumer Phillips Theorem	13
1.5 The Characterization of the Infinitesimal Generators of C_0 Semigroups	17
1.6 Groups of Bounded Operators	22
1.7 The Inversion of the Laplace Transform	25
1.8 Two Exponential Formulas	32
1.9 Pseudo Resolvents	36
1.10 The Dual Semigroup	38
Chapter 2	
Spectral Properties and Regularity	42
2.1 Weak Equals Strong	42
2.2 Spectral Mapping Theorems	44
2.3 Semigroups of Compact Operators	48
2.4 Differentiability	51
2.5 Analytic Semigroups	60
2.6 Fractional Powers of Closed Operators	69
Chapter 3	
Perturbations and Approximations	76
3.1 Perturbations by Bounded Linear Operators	76
3.2 Perturbations of Infinitesimal Generators of Analytic Semigroups	80
3.3 Perturbations of Infinitesimal Generators of Contraction Semigroups	81
3.4 The Trotter Approximation Theorem	84

3.5	A General Representation Theorem	89
3.6	Approximation by Discrete Semigroups	94
Chapter 4		
The Abstract Cauchy Problem		100
4.1	The Homogeneous Initial Value Problem	100
4.2	The Inhomogeneous Initial Value Problem	105
4.3	Regularity of Mild Solutions for Analytic Semigroups	110
4.4	Asymptotic Behavior of Solutions	115
4.5	Invariant and Admissible Subspaces	121
Chapter 5		
Evolution Equations		126
5.1	Evolution Systems	126
5.2	Stable Families of Generators	130
5.3	An Evolution System in the Hyperbolic Case	134
5.4	Regular Solutions in the Hyperbolic Case	139
5.5	The Inhomogeneous Equation in the Hyperbolic Case	146
5.6	An Evolution System for the Parabolic Initial Value Problem	149
5.7	The Inhomogeneous Equation in the Parabolic Case	167
5.8	Asymptotic Behavior of Solutions in the Parabolic Case	172
Chapter 6		
Some Nonlinear Evolution Equations		183
6.1	Lipschitz Perturbations of Linear Evolution Equations	183
6.2	Semilinear Equations with Compact Semigroups	191
6.3	Semilinear Equations with Analytic Semigroups	195
6.4	A Quasilinear Equation of Evolution	200
Chapter 7		
Applications to Partial Differential Equations—Linear Equations		206
7.1	Introduction	206
7.2	Parabolic Equations— L^2 Theory	208
7.3	Parabolic Equations— L^p Theory	212
7.4	The Wave Equation	219
7.5	A Schrödinger Equation	223
7.6	A Parabolic Evolution Equation	225
Chapter 8		
Applications to Partial Differential Equations—Nonlinear Equations		230
8.1	A Nonlinear Schrödinger Equation	230
8.2	A Nonlinear Heat Equation in \mathbb{R}^1	234
8.3	A Semilinear Evolution Equation in \mathbb{R}^3	238
8.4	A General Class of Semilinear Initial Value Problems	241
8.5	The Korteweg-de Vries Equation	247
Bibliographical Notes and Remarks		252
Bibliography		264
Index		277