

Contents

Preface — VII

1 Introduction — 1

2 Preliminary background — 16

- 2.1 Notation and definitions — 16
- 2.2 Generalized Banach space — 17
- 2.3 Phase spaces — 18
- 2.4 Measure of noncompactness — 19
- 2.5 Semigroups — 22
- 2.6 Necessary lemmas, theorems and properties — 24
- 2.7 Fixed-point theorems — 26

3 Semilinear integro-differential evolution equations — 29

- 3.1 Introduction and motivations — 29
- 3.2 Existence and successive approximations of mild solution — 30
 - 3.2.1 Existence results — 31
 - 3.2.2 An example — 36
- 3.3 Asymptotically almost automorphic mild solutions — 37
 - 3.3.1 Existence results — 37
 - 3.3.2 Example — 51
- 3.4 PC-asymptotically almost automorphic mild solutions — 54
 - 3.4.1 Existence results — 54
 - 3.4.2 Continuous dependence on the initial condition — 65
 - 3.4.3 An example — 66
- 3.5 Notes and remarks — 68

4 Impulsive integro-differential equations with delay — 69

- 4.1 Introduction and motivations — 69
- 4.2 Functional integro-differential equations — 69
 - 4.2.1 Some necessary results — 70
 - 4.2.2 Global existence and attractivity for functional integro-differential equations — 72
 - 4.2.3 Functional integro-differential equations with state-dependent delay — 84
 - 4.2.4 An example — 96
- 4.3 Notes and remarks — 100

5 Neutral impulsive integro-differential equations — 101

- 5.1 Introduction and motivations — 101
- 5.2 Neutral functional integro-differential evolution equations — 102

5.2.1	Necessary results — 102
5.2.2	Existence results — 105
5.2.3	Ulam–Hyers–Rassias stability results — 114
5.2.4	An example — 122
5.3	Approximate controllability of neutral functional integro-differential equations — 125
5.3.1	Necessary results — 126
5.3.2	Integro-differential equations with infinite delay — 128
5.3.3	Neutral functional integro-differential equations — 132
5.3.4	An example — 141
5.4	Notes and remarks — 143
6	Second-order impulsive integro-differential evolution equations with delay — 144
6.1	Introduction and motivations — 144
6.2	Approximate controllability and Ulam stability — 145
6.2.1	Necessary results — 146
6.2.2	Existence of mild solutions — 149
6.2.3	Controllability results — 156
6.2.4	Ulam–Hyers–Rassias stability results — 159
6.2.5	An example — 164
6.3	Optimal control and approximate controllability — 167
6.3.1	Necessary results — 168
6.3.2	Existence of a mild solution — 169
6.3.3	Approximate controllability — 179
6.3.4	Existence of optimal controls — 181
6.3.5	An example — 186
6.4	Notes and remarks — 189
7	Coupled integro-differential systems with impulses — 190
7.1	Introduction and motivations — 190
7.2	Existence and Ulam–Hyers–Rassias stability of mild solutions — 190
7.2.1	Necessary results — 191
7.2.2	Existence results — 192
7.2.3	Results of Ulam’s-type stability — 202
7.2.4	Data dependance — 206
7.2.5	An example — 208
7.3	Existence and controllability results — 211
7.3.1	Necessary results — 212
7.3.2	Existence results — 213
7.3.3	Controllability of solutions — 227
7.3.4	An example — 236

7.4 Notes and remarks — **239**

8 Coupled integro-differential neutral impulsive systems — 240

8.1 Introduction and motivations — **240**

8.2 System of neutral functional integro-differential evolution equations — **240**

8.2.1 Necessary results — **241**

8.2.2 Mild solutions with instantaneous impulses — **243**

8.2.3 Mild solutions with noninstantaneous impulses — **251**

8.2.4 An example — **261**

8.3 Notes and remarks — **266**

Bibliography — 267

Index — 283