

Contents

Preface	v
1 Random Measures on Metric Spaces	1
1.1 Borel Measures	1
1.2 Laplace Functionals	8
1.3 Poisson Random Measures	13
1.4 Infinitely Divisible Random Measures	15
1.5 Lévy–Khintchine Type Representations	21
1.6 Notes and Comments	26
2 Measure-Valued Branching Processes	29
2.1 Definitions and Basic Properties	29
2.2 Integral Evolution Equations	33
2.3 Dawson–Watanabe Superprocesses	38
2.4 Examples of Superprocesses	44
2.5 Some Moment Formulas	47
2.6 Notes and Comments	54
3 One-Dimensional Branching Processes	57
3.1 Continuous-State Branching Processes	57
3.2 Long-Time Evolution Rates	63
3.3 Immigration and Conditioned Processes	66
3.4 More Conditional Limit Theorems	70
3.5 Scaling Limits of Discrete Processes	75
3.6 Notes and Comments	83
4 Branching Particle Systems	87
4.1 Particle Systems with Local Branching	87
4.2 Scaling Limits of Local Branching Systems	92
4.3 General Branching Particle Systems	97
4.4 Scaling Limits of General Branching Systems	100

4.5	Notes and Comments	104
5	Basic Regularities of Superprocesses	107
5.1	Right Continuous Realizations	107
5.2	The Strong Markov Property	109
5.3	Borel Right Superprocesses	114
5.4	Weighted Occupation Times	118
5.5	A Counterexample	122
5.6	Notes and Comments	125
6	Constructions by Transformations	127
6.1	Spaces of Tempered Measures	127
6.2	Multitype Superprocesses	132
6.3	A Two-Type Superprocess	135
6.4	Change of the Probability Measure	136
6.5	Time-Inhomogeneous Superprocesses	138
6.6	Notes and Comments	142
7	Martingale Problems of Superprocesses	145
7.1	The Differential Evolution Equation	145
7.2	Generators and Martingale Problems	152
7.3	Worthy Martingale Measures	160
7.4	A Representation for Superprocesses	168
7.5	Transforms by Martingales	172
7.6	Notes and Comments	176
8	Entrance Laws and Excursion Laws	179
8.1	Some Simple Properties	179
8.2	Minimal Probability Entrance Laws	183
8.3	Infinitely Divisible Probability Entrance Laws	187
8.4	Kuznetsov Measures and Excursion Laws	193
8.5	Super-Absorbing-Barrier Brownian Motions	201
8.6	Notes and Comments	205
9	Structures of Independent Immigration	207
9.1	Skew Convolution Semigroups	207
9.2	The Canonical Entrance Rule	212
9.3	Regular Immigration Superprocesses	215
9.4	Constructions of the Trajectories	221
9.5	One-Dimensional Stochastic Equations	228
9.6	Notes and Comments	231

10	State-Dependent Immigration Structures	233
10.1	Deterministic Immigration Rates	233
10.2	Stochastic Immigration Rates	235
10.3	Interactive Immigration Rates	241
10.4	General Interactive Immigration	247
10.5	Notes and Comments	252
11	Generalized Ornstein–Uhlenbeck Processes	255
11.1	Generalized Mehler Semigroups	255
11.2	Gaussian Type Semigroups	259
11.3	Non-Gaussian Type Semigroups	263
11.4	Extensions of Centered Semigroups	266
11.5	Construction of the Processes	273
11.6	Notes and Comments	279
12	Small-Branching Fluctuation Limits	281
12.1	The Brownian Immigration Superprocess	281
12.2	Stochastic Processes in Nuclear Spaces	283
12.3	Fluctuation Limits in the Schwartz Space	290
12.4	Fluctuation Limits in Sobolev Spaces	296
12.5	Notes and Comments	298
A	Markov Processes	301
A.1	Measurable Spaces	301
A.2	Stochastic Processes	304
A.3	Right Markov Processes	306
A.4	Ray–Knight Completion	315
A.5	Entrance Space and Entrance Laws	319
A.6	Concatenations and Weak Generators	321
A.7	Time–Space Processes	329
	References	333
	Subject Index	345
	Symbol Index	349