

# Contents

Preface to the Second Edition	vii
Preface to the First Edition	ix
Principal Notation	xvii
Concordance of Statements from the First Edition	xxi
<b>1 Early History</b>	<b>1</b>
1.1 Life Tables and Renewal Theory	1
1.2 Counting Problems	8
1.3 Some More Recent Developments	13
<b>2 Basic Properties of the Poisson Process</b>	<b>19</b>
2.1 The Stationary Poisson Process	19
2.2 Characterizations of the Stationary Poisson Process: I. Complete Randomness	26
2.3 Characterizations of the Stationary Poisson Process: II. The Form of the Distribution	31
2.4 The General Poisson Process	34
<b>3 Simple Results for Stationary Point Processes on the Line</b>	<b>41</b>
3.1 Specification of a Point Process on the Line	41
3.2 Stationarity: Definitions	44
3.3 Mean Density, Intensity, and Batch-Size Distribution	46
3.4 Palm–Khinchin Equations	53
3.5 Ergodicity and an Elementary Renewal Theorem Analogue	60
3.6 Subadditive and Superadditive Functions	64

<b>4</b>	<b>Renewal Processes</b>	<b>66</b>
4.1	Basic Properties	66
4.2	Stationarity and Recurrence Times	74
4.3	Operations and Characterizations	78
4.4	Renewal Theorems	83
4.5	Neighbours of the Renewal Process: Wold Processes	92
4.6	Stieltjes-Integral Calculus and Hazard Measures	106
<b>5</b>	<b>Finite Point Processes</b>	<b>111</b>
5.1	An Elementary Example: Independently and Identically Distributed Clusters	112
5.2	Factorial Moments, Cumulants, and Generating Function Relations for Discrete Distributions	114
5.3	The General Finite Point Process: Definitions and Distributions	123
5.4	Moment Measures and Product Densities	132
5.5	Generating Functionals and Their Expansions	144
<b>6</b>	<b>Models Constructed via Conditioning: Cox, Cluster, and Marked Point Processes</b>	<b>157</b>
6.1	Infinite Point Families and Random Measures	157
6.2	Cox (Doubly Stochastic Poisson) Processes	169
6.3	Cluster Processes	175
6.4	Marked Point Processes	194
<b>7</b>	<b>Conditional Intensities and Likelihoods</b>	<b>211</b>
7.1	Likelihoods and Janossy Densities	212
7.2	Conditional Intensities, Likelihoods, and Compensators	229
7.3	Conditional Intensities for Marked Point Processes	246
7.4	Random Time Change and a Goodness-of-Fit Test	257
7.5	Simulation and Prediction Algorithms	267
7.6	Information Gain and Probability Forecasts	275
<b>8</b>	<b>Second-Order Properties of Stationary Point Processes</b>	<b>288</b>
8.1	Second-Moment and Covariance Measures	289
8.2	The Bartlett Spectrum	303
8.3	Multivariate and Marked Point Processes	316
8.4	Spectral Representation	331
8.5	Linear Filters and Prediction	342
8.6	P.P.D. Measures	357

<b>A1 A Review of Some Basic Concepts of Topology and Measure Theory</b>	<b>368</b>
A1.1 Set Theory	368
A1.2 Topologies	369
A1.3 Finitely and Countably Additive Set Functions	372
A1.4 Measurable Functions and Integrals	374
A1.5 Product Spaces	377
A1.6 Dissecting Systems and Atomic Measures	382
<b>A2 Measures on Metric Spaces</b>	<b>384</b>
A2.1 Borel Sets and the Support of Measures	384
A2.2 Regular and Tight Measures	386
A2.3 Weak Convergence of Measures	390
A2.4 Compactness Criteria for Weak Convergence	394
A2.5 Metric Properties of the Space $\mathcal{M}_X$	398
A2.6 Boundedly Finite Measures and the Space $\mathcal{M}_X^\#$	402
A2.3 Measures on Topological Groups	407
A2.3 Fourier Transforms	411
<b>A3 Conditional Expectations, Stopping Times, and Martingales</b>	<b>414</b>
A3.1 Conditional Expectations	414
A3.2 Convergence Concepts	418
A3.3 Processes and Stopping Times	423
A3.4 Martingales	428
<b>References with Index</b>	<b>432</b>
<b>Subject Index</b>	<b>452</b>

#### Chapter Titles for Volume II

9	General Theory of Point Processes and Random Measures
10	Special Classes of Processes
11	Convergence Concepts and Limit Theorems
12	Ergodic Theory and Stationary Processes
13	Palm Theory
14	Evolutionary Processes and Predictability
15	Spatial Point Processes