

## Contents

<i>Preface</i>	<i>page</i> ix
<i>Notation and Conventions</i>	xiii
<b>Part I 100 Years of Cosmology</b>	1
1 Emerging Cosmology	3
2 The Cosmic Expansion	19
3 The Cosmic Microwave Background	48
4 Recent Cosmology	77
<b>Part II Newtonian Cosmology</b>	95
5 Newtonian Cosmology	97
6 Dark Energy Cosmological Models	130
7 The Early Universe	154
8 The Inhomogeneous Universe	187
9 The Inflationary Universe	208
<b>Part III Relativistic Cosmology</b>	235
10 Minkowski Space	237
11 The Energy Momentum Tensor	268
12 General Relativity	290
13 Space-Time Geometry and Calculus	307
14 The Einstein Field Equations	340
15 Solutions of the Einstein Equations	358

---

16	The Robertson–Walker Solution	386
17	Congruences, Curvature and Raychaudhuri	411
18	Observing and Measuring the Universe	428
	<b>Part IV The Physics of Matter and Radiation</b>	449
19	Physics of the CMB Radiation	451
20	Recombination of the Primeval Plasma	476
21	CMB Polarisation	491
22	CMB Anisotropy	516
	<b>Part V Precision Tools for Precision Cosmology</b>	539
23	Likelihood	541
24	Frequentist Hypothesis Testing	567
25	Statistical Inference: Bayesian	582
26	CMB Data Processing	606
27	Parameterising the Universe	634
28	Precision Cosmology	645
29	Epilogue	670
	Appendix A SI, CGS and Planck Units	673
	Appendix B Magnitudes and Distances	679
	Appendix C Representing Vectors and Tensors	682
	Appendix D The Electromagnetic Field	685
	Appendix E Statistical Distributions	691
	Appendix F Functions on a Sphere	695
	Appendix G Acknowledgements	700
	<i>References</i>	702
	<i>Index</i>	754