

# Contents

Preface	ix
Chapter 1. Index Theory	1
Analysis of Dirac operators	1
Index theory	4
Index theory and coarsening	6
Chapter 2. Coarse Geometry	9
The coarse category	9
Coarse algebraic topology	13
Chapter 3. $C^*$ -Algebras	17
The coarse index	20
Relative index theory	22
Appendix: $K$ -theory for $C^*$ -algebras	24
Chapter 4. An example of a higher index theorem	27
Odd operators	27
Partitions of a noncompact manifold	28
The $K$ -theory of $C^*( \mathbb{R} )$ .	32
Chapter 5. Assembly	35
Kasparov's $K$ -homology	35
The assembly map	38
Equivariant assembly	41
Chapter 6. Surgery	45
Manifold structures	45
Novikov's conjecture	51
Bounded surgery	53
Positive scalar curvature	54
Chapter 7. Mapping surgery to analysis	57

Invariants of positive scalar curvature metrics	57
Poincaré complexes	61
A manifold structure invariant	63
Bounded structures	66
Chapter 8. The coarse Baum-Connes conjecture	69
The coarse assembly map	69
The principle of descent	71
Chapter 9. Methods of computation	77
A coarse Mayer-Vietoris sequence	77
Coarse homotopy	80
Scaleable spaces	83
Coarse Baum-Connes for hyperbolic spaces	84
Chapter 10. Coarse structures and boundaries	87
Abstract coarse structures	87
The assembly map for continuous control	89
References	93
Index	99