

Cambridge University Press

978-0-521-35881-1 - The Theory and Applications of Harmonic Integrals

W. V. D. Hodge

Table of Contents

[More information](#)

## CONTENTS

Foreword by Sir Michael Atiyah, F.R.S.	page vii
Preface	xi
<b>Chapter I. RIEMANNIAN MANIFOLDS</b>	
1. Introduction	1
2. Manifolds of class $u$	6
3. The Riemannian metric	11
4. Orientation	13
5. Geometry of a Riemannian manifold	16
<i>Differential geometry</i>	17
6. Tensors and their algebra	17
7. Numerical tensors. The metrical tensors	21
8. Parallel displacement	23
9. Covariant differentiation	28
10. Riemannian geometry	31
11. Geodesic coordinates	34
<i>Topology</i>	36
12. Polyhedral complexes	36
13. Complexes of class $v$	44
14. Manifolds	50
15. Orientation	51
16. Duality	52
17. Intersections	54
18. Product manifolds	64
<b>Chapter II. INTEGRALS AND THEIR PERIODS</b>	
19. Multiple integrals	68
20. The theorem of Stokes	74
21. Calculus of forms	78
22. Periods	79
23. The first theorem of de Rham	87
24. Proof of de Rham's first theorem	92
25. De Rham's second theorem	100
26. Products of integrals and intersections of cycles	101
<b>Chapter III. HARMONIC INTEGRALS</b>	
27. Definition of harmonic forms	107
28. Approximation by closed $p$ -sets	113
29. Periods of harmonic integrals	117

Cambridge University Press

978-0-521-35881-1 - The Theory and Applications of Harmonic Integrals

W. V. D. Hodge

Table of Contents

[More information](#)

vi

## CONTENTS

30. The existence theorem: preliminary considerations	<i>page</i> 119
31. The existence theorem, <i>continued</i>	130
32. Digression on the solution of integral equations	134
33. The existence theorem, <i>concluded</i>	139
34. De Rham's second theorem	143
35. The equations satisfied by a harmonic tensor	144

## Chapter IV. APPLICATIONS TO ALGEBRAIC VARIETIES

36. Algebraic varieties	148
37. Construction of the Riemannian manifold	150
38. Discussion of the metric	154
39. The affine connection and curvature tensor	159
40. Harmonic integrals on an algebraic manifold	165
41. The fundamental forms	168
42. An analysis of forms associated with an algebraic manifold	171
43. The classification of harmonic integrals on an algebraic manifold	178
44. Topology of algebraic manifolds	182
45. Periods of harmonic integrals	185
46. Complex parameters	188
47. Properties of the period matrices of effective integrals	192
48. Change of metric	198
49. Some enumerative results	200
50. Defective systems of integrals	201
51. Applications to problems in algebraic geometry	212
52. Some results for surfaces	218

Chapter V. APPLICATIONS TO THE THEORY  
OF CONTINUOUS GROUPS

53. Continuous groups	226
54. Geometry of the transformation space	236
55. The transformation of tensors	240
56. Invariant integrals	242
57. The group manifold	249
58. The four main classes of simple groups	258
59. The unimodular group $L_n$	264
60. The orthogonal group $O_{2\nu+1}$	272
61. The orthogonal group $O_{2\nu}$	275
62. The symplectic group $S_{2\nu}$	279
63. Conclusion	280
Index	282