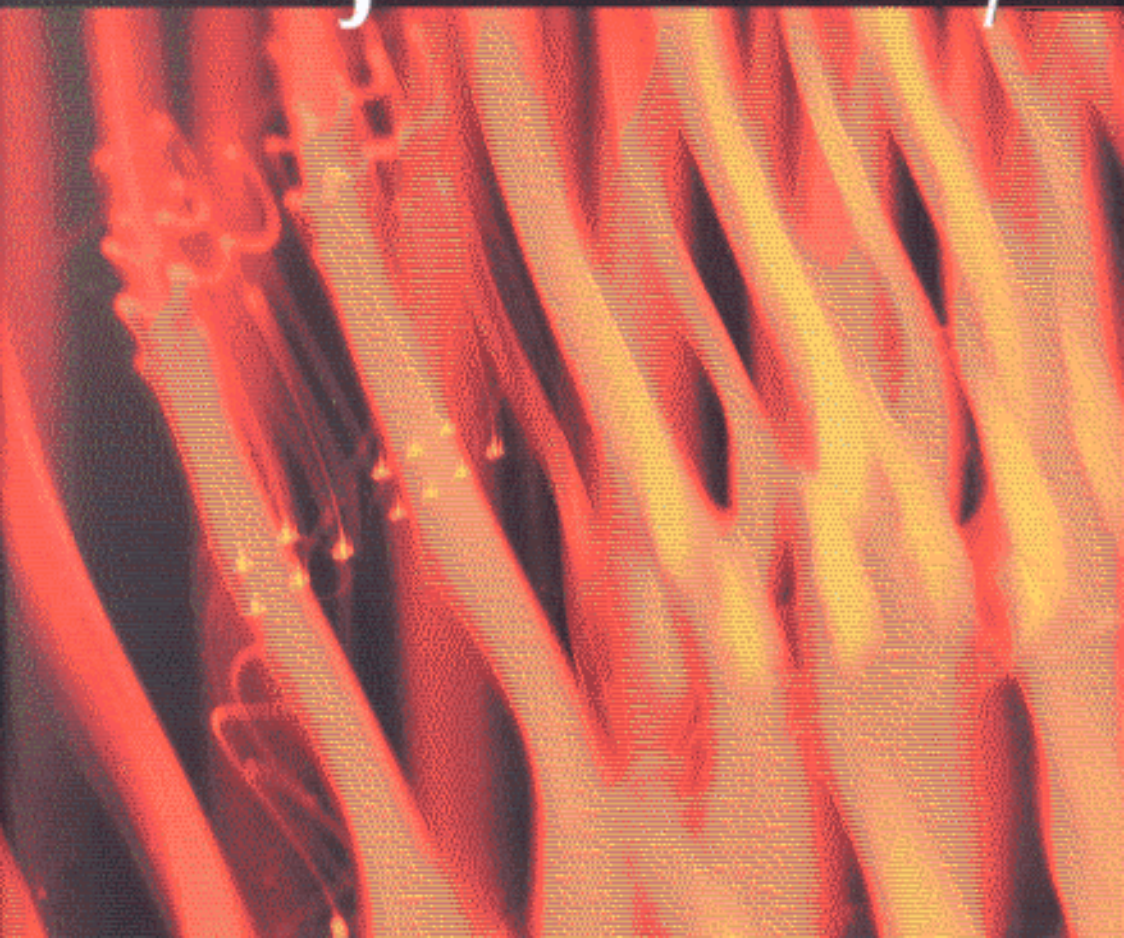


Martin Väth

A Second Course

Integration Theory



Contents

<i>Preface</i>	v
Part 1: Basic Integration Theory	1
<i>Overview</i>	3
1. Abstract Integration	5
1.1 Basic Notions	5
1.2 Measurable Functions	10
1.3 Definition of the Integral and Convergence Theorems	38
1.4 Extension of Measures	64
1.5 Product Measures and Fubini's Theorem	75
1.6 Exercises	89
2. Adding a Topological Structure: The Radon Measure	95
2.1 Preliminaries from Topology	95
2.2 Borel Measures and Luzin's Theorem	108
2.3 Radon Measures	113
2.4 Exercises	125
3. Adding a Group Structure: The Haar Measure	129
3.1 Preliminaries from Topological Groups	129
3.2 The Haar Measure	132
3.3 Exercises	149

4. Spaces of Measurable Functions	153
4.1 L_p Spaces	153
4.2 Ideal Spaces	156
4.3 Dual Spaces	167
4.4 Exercises	178
5. Convolutions	183
5.1 The Modular Function	183
5.2 Convolutions	190
5.3 Exercises	198
6. Connections with Logic and Set Theory	201
6.1 The Axiom of Choice and the Continuum Hypothesis	201
6.2 The Banach-Tarski Paradox	213
6.3 Consequences on Measure Theory	217
6.4 Exercises	229
7. Special Properties of the Lebesgue Measure	233
7.1 Connections with the Riemann Integral	233
7.2 The Fundamental Theorem of Calculus	237
7.3 Exercises	247
8. Miscellaneous	249
8.1 Some Useful Formulas	249
8.2 The Graph of a Function and Rearrangements	255
8.3 Exercises	263

<i>Bibliography</i>	265
---------------------	-----

<i>Index</i>	269
--------------	-----