Contents

Preface vii

Chapter 1. Preliminaries 1
1. Riemann surfaces and line bundles 1
2. Introduction of first-order deformations 2
3. Hyperbolic geometry 4
4. Standard cusps and collars 6
5. Uniformization, $PSL(2;\mathbb{R})$ representation spaces and Mumford compactness 7
6. Collars converging to cusp pairs, version 1.0 8
7. Holomorphic plumbing fixture - collars converging to cusps, version 2.0 9
8. Further readings 11

Chapter 2. Teichmüller Space and Horizontal Strip Deformations 13
1. Definition of Teichmüller space 13
2. Deformations of concentric annuli and horizontal strips 15
3. Variational formulas for a horizontal strip 17
4. Plumbing family tangents and cotangents 20
5. Further readings 21

Chapter 3. Geodesic-Lengths, Twists and Symplectic Geometry 23
1. Basics of geodesic-lengths and twists 23
2. Twist derivatives and Riera’s formula 25
3. Hessian of geodesic-length 27
4. Fenchel-Nielsen coordinates are canonical 29
5. Further readings 30

Chapter 4. Geometry of the Augmented Teichmüller Space, Part 1 33
1. Augmented Teichmüller space 33
2. Second order Masur type expansions 34
3. Model metric comparison 38
4. Teichmüller metric 39
5. Further readings 40

Chapter 5. Geometry of the Augmented Teichmüller Space, Part 2 43
1. $CAT(0)$ geometry and geodesics on $\overline{\mathcal{T}}$ 43
2. Properties of Bers regions 46