

## **CONTENTS OF VOLUME II**

### **CHAPTER VII Submanifolds**

<b>1.</b>	Frame bundles of a submanifold . . . . .	<b>1</b>
<b>2.</b>	The Gauss map . . . . .	<b>6</b>
<b>3.</b>	Covariant differentiation and second fundamental form . . . . .	<b>10</b>
<b>4.</b>	Equations of Gauss and Codazzi . . . . .	<b>22</b>
<b>5.</b>	Hypersurfaces in a Euclidean space . . . . .	<b>29</b>
<b>6.</b>	Type number and rigidity . . . . .	<b>42</b>
<b>7.</b>	Fundamental theorem for hypersurfaces . . . . .	<b>47</b>
<b>8.</b>	Auto-parallel submanifolds and totally geodesic submanifolds . . . . .	<b>53</b>

### **CHAPTER VIII Variations of the Length Integral**

<b>1.</b>	Jacobi fields . . . . .	<b>63</b>
<b>2.</b>	Jacobi fields in a Riemannian manifold . . . . .	<b>68</b>
<b>3.</b>	Conjugate points . . . . .	<b>71</b>
<b>4.</b>	Comparison theorem . . . . .	<b>76</b>
<b>5.</b>	The first and second variations of the length integral . . . . .	<b>79</b>
<b>6.</b>	Index theorem of Morse . . . . .	<b>88</b>
<b>7.</b>	Cut loci . . . . .	<b>96</b>
<b>8.</b>	Spaces of non-positive curvature . . . . .	<b>102</b>
<b>9.</b>	Center of gravity and fixed points of isometries . . . . .	<b>108</b>

### **CHAPTER IX Complex Manifolds**

<b>1.</b>	Algebraic preliminaries . . . . .	<b>114</b>
<b>2.</b>	Almost complex manifolds and complex manifolds . . . . .	<b>121</b>
<b>3.</b>	Connections in almost complex manifolds . . . . .	<b>141</b>
<b>4.</b>	Hermitian metrics and Kaehler metrics . . . . .	<b>146</b>
<b>5.</b>	Kaehler metrics in local coordinate systems . . . . .	<b>155</b>
<b>6.</b>	Examples of Kaehler manifolds . . . . .	<b>159</b>
<b>7.</b>	Holomorphic sectional curvature . . . . .	<b>165</b>
<b>8.</b>	De Rham decomposition of Kaehler manifolds . . . . .	<b>171</b>

<b>9.</b>	Curvature of Kaehler submanifolds . . . . .	175
<b>10.</b>	Hermitian connections in Hermitian vector bundles . . . . .	178

**CHAPTER X**  
**Homogeneous Spaces**

<b>1.</b>	Invariant affine connections . . . . .	186
<b>2.</b>	Invariant connections on reductive homogeneous spaces . . . . .	190
<b>3.</b>	Invariant indefinite Riemannian metrics . . . . .	200
<b>4.</b>	Holonomy groups of invariant connections . . . . .	204
<b>5.</b>	The de Rham decomposition and irreducibility . . . . .	210
<b>6.</b>	Invariant almost complex structures . . . . .	216

**CHAPTER XI**  
**Symmetric Spaces**

<b>1.</b>	Affine locally symmetric spaces . . . . .	222
<b>2.</b>	Symmetric spaces . . . . .	225
<b>3.</b>	The canonical connection on a symmetric space . . . . .	230
<b>4.</b>	Totally geodesic submanifolds . . . . .	234
<b>5.</b>	Structure of symmetric Lie algebras . . . . .	238
<b>6.</b>	Riemannian symmetric spaces . . . . .	243
<b>7.</b>	Structure of orthogonal symmetric Lie algebras . . . . .	246
<b>8.</b>	Duality . . . . .	253
<b>9.</b>	Hermitian symmetric spaces . . . . .	259
<b>10.</b>	Examples . . . . .	264
<b>11.</b>	An outline of the classification theory . . . . .	289

**CHAPTER XII**  
**Characteristic Classes**

<b>1.</b>	Weil homomorphism . . . . .	293
<b>2.</b>	Invariant polynomials . . . . .	298
<b>3.</b>	Chern classes . . . . .	305
<b>4.</b>	Pontrjagin classes . . . . .	312
<b>5.</b>	Euler classes . . . . .	314

**APPENDICES**

<b>8.</b>	Integrable real analytic almost complex structures . . . . .	321
<b>9.</b>	Some definitions and facts on Lie algebras . . . . .	325

## NOTES

<b>12.</b>	Connections and holonomy groups (Supplement to Note 1)	331
<b>13.</b>	The automorphism group of a geometric structure (Supplement to Note 9) . . . . .	332
<b>14.</b>	The Laplacian . . . . .	337
<b>15.</b>	Surfaces of constant curvature in $\mathbf{R}^3$ . . . . .	343
<b>16.</b>	Index of nullity . . . . .	347
<b>17.</b>	Type number and rigidity of imbedding . . . . .	349
<b>18.</b>	Isometric imbeddings . . . . .	354
<b>19.</b>	Equivalence problems for Riemannian manifolds . . . . .	357
<b>20.</b>	Gauss-Bonnet theorem . . . . .	358
<b>21.</b>	Total curvature . . . . .	361
<b>22.</b>	Topology of Riemannian manifolds with positive curvature	364
<b>23.</b>	Topology of Kaehler manifolds with positive curvature	368
<b>24.</b>	Structure theorems on homogeneous complex manifolds	373
<b>25.</b>	Invariant connections on homogeneous spaces. . . . .	375
<b>26.</b>	Complex submanifolds . . . . .	378
<b>27.</b>	Minimal submanifolds . . . . .	379
<b>28.</b>	Contact structure and related structures . . . . .	381
 Bibliography . . . . .		387
 Summary of Basic Notations. . . . .		455
 Index for Volumes I and II . . . . .		459
 Errata for <i>Foundations of Differential Geometry</i> , Volume I . . . . .		469