## **CONTENTS**

Series Edit	or's Preface	v
Preface		vi
PART I.	BASIC CONCEPTS OF DIFFERENTIAL GEOMETRY	
1.1	General Concepts of Geometry	1
1.2	Coordinates in Euclidean Space	15
1.3	Riemannian Metric in a Region of Euclidean Space	24
1.4	Pseudo-Euclidean Space and Lobachevsky Geometry	33
1.5	Flat Curves	46
1.6	Space Curves	54
1.7	The Theory of Surfaces in Three-Dimensional Space.	
	Introduction	61
1.8	The Theory of Surfaces.	
	Riemannian Metric and the Concept of Area	70
1.9	The Theory of Surfaces.	
	The Area of a Region on the Surface	77
1.10	The Theory of Surfaces.	
	The Theory of Curvature and the Second Quadratic Form	89
1.11	The Theory of Surfaces.	
	Gaussian Curvature	95
1.12	The Theory of Surfaces.	
	Invariants of a Pair of Quadratic Forms and Euler's Theorem	105
1.13	The Language of Complex Numbers in Geometry.	
	Conformal Transformations. Isothermal Coordinates	114
	The Concept of a Manifold and the Simplest Examples	127
1.15	Geodesics	151
PART II. T	TENSORS. RIEMANNIAN GEOMETRY	
2.1	Rank-One and Rank-Two Tensors	159
2.2	Tensors of General Form. Examples	168
2.3	Algebraic Operations on Tensors	177
2.4	Symmetric and Skew-Symmetric Tensors	181
2.5	Differential Calculus of Skew-Symmetric Tensors of type $(0, k)$	188
2.6	Covariant Differentiation. Euclidean and General Connections	198
2.7	Basic Properties of Covariant Differentiation	211

x CONTENTS

	2.8		ant Differentiation and the Riemannian Metric.	221	
	2.9		Parallel Transport of Vectors along Curves. Geodesics nnian Curvature Tensor.	221	
	,		Gaussian Curvature as an Intrinsic Invariant of the Surface	234	
	2.10 Skew-Symmetric Tensors and the Theory of Integration				
	2.11 The General Stokes Formula and Examples				
PART	ТШ.	BASIC	ELEMENTS OF TOPOLOGY		
	3.1	Examp	eles of Differential Forms	280	
	3.2		egree of Mapping. Homotopy	287	
	3.3		ations of the Degree of a Mapping	297	
	3.4	Vector	Fields	302	
	3.5	Function	ons on Manifolds and Vector Fields	318	
	3.6	Singul	ar Points of Vector Fields. The Fundamental Group	328	
	3.7	The Fu	andamental Group and Covering	337	
APPE	ENDI	CES			
	Appe	endix 1	The Simplest Groups of Transformations of Euclidean		
			and Non-Euclidean Spaces	343	
	Appe	endix 2	Some Elements of Modern Concepts of the Geometry		
			of the Real World	356	
	Appendix 3		Crystallographic Croups	385	
	Appendix 4		Homology Groups and Methods of their Calculation	402	
	Appe	endix 5	The Theory of Geodesics, Second Variation and		
			Variational Calculus	422	
	Appendix 6		Basic Geometric Properties of the Lobachevskian Plane	444	
	Appendix 7		Selected Exerices on the Material of the Course	455	
	Addi	itional M	faterial	474	
Refer	ences	3		485	
Index	(			487	