

Tensor Calculus on Time Scales

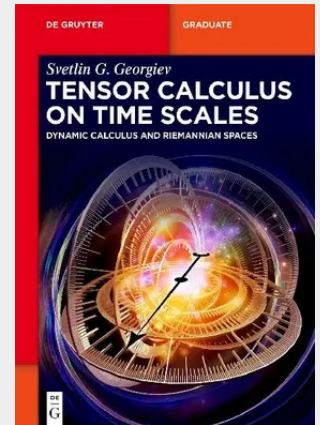
Dynamic Calculus and Riemannian Spaces

In chapter 1 N dimensional spaces, contravariant vectors, covariant vectors and invariants are introduced. Some of their properties are deduced. Transformations of coordinates are investigated. Chapter 2 provides an informative introduction concerning the origin and nature of the tensor concept and the scope of the tensor calculus. The tensor algebra has been developed in an N dimensional space. Contravariant, covariant and mixed tensors of arbitrary order are defined. Some of their properties are deduced. The quotient law of the tensors is formulated and proved. Outer product and contractions are introduced. In Chapter 3, an N dimensional Riemannian space has been chosen for the development of tensor calculus. Metric and associated tensors are defined and some of their properties are explored. Affine and curvilinear coordinates are introduced. In Chapter 4, the Christoffel symbols of the first and second kinds are defined. Some of their basic properties are established. Covariant derivatives are introduced. The divergence, Laplace operator and curl are defined and explored. Intrinsic differentiation is studied. Chapter 5 is devoted to Riemann-Christoffel tensor, Ricci tensor, covariant curvature tensor, Riemann curvature and Einstein tensor and we deduce some of their properties. In Chapter 6, we represent some applications of tensor calculus in relativistic dynamics and relativistic kinematics. Lorentz transformations are derived on arbitrary time scales.

Velocity and acceleration vectors are defined and developed. Lagrange equations are deduced. Conservation laws for the energy momentum vector and angular momentum tensor are obtained.

The aim of this book is to present a clear and well-organized treatment of the concept behind the development of mathematics and solution techniques. The text material of this book is presented in highly readable, mathematically solid format. Many practical problems are illustrated displaying a wide variety of solution techniques.

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79,95 €

74,72 € (zzgl. MwSt.)

Lieferfrist: bis zu 10 Tage

Artikelnummer: 9783112228487

Medium: Buch

ISBN: 978-3-11-222848-7

Verlag: De Gruyter

Erscheinungstermin: 02.02.2026

Sprache(n): Englisch

Auflage: 1. Auflage 2026

Serie: De Gruyter Textbook

Produktform: Kartoniert

Gewicht: 523 g

Seiten: 300

Format (B x H): 176 x 242 mm

