1. Record Nr. UNINA9910480056903321

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Titolo	Vector Calculus [[electronic resource] /] / by Paul C. Matthews
Pubbl/distr/stampa	London : , : Springer London : , : Imprint : Springer, , 1998
ISBN	1-4471-0597-4
Edizione	[1st ed. 1998.]
Descrizione fisica	1 online resource (X, 182 p. 1 illus.)
Collana	Springer Undergraduate Mathematics Series, , 1615-2085
Disciplina	515/.63
Soggetti	Applied mathematics Engineering mathematics Mathematical physics Engineering Applications of Mathematics Theoretical, Mathematical and Computational Physics Engineering, general
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Includes index. "With 63 figures."
Nota di contenuto	1. Vector Algebra -- 1.1 Vectors and scalars -- 1.2 Dot product -- 1.3 Cross product -- 1.4 Scalar triple product -- 1.5 Vector triple product -- 1.6 Scalar fields and vector fields -- 2. Line, Surface and Volume Integrals -- 2.1 Applications and methods of integration -- 2.2 Line integrals -- 2.3 Surface integrals -- 2.4 Volume integrals -- 3. Gradient, Divergence and Curl -- 3.1 Partial differentiation and Taylor series -- 3.2 Gradient of a scalar field -- 3.3 Divergence of a vector field -- 3.4 Curl of a vector field -- 4. Suffix Notation and its Applications -- 4.1 Introduction to suffix notation -- 4.2 The Kronecker delta ?ij -- 4.3 The alternating tensor ?ijk -- 4.4 Relation between ?ijk and ?ij -- 4.5 Grad, div and curl in suffix notation -- 4.6 Combinations of grad, div and curl -- 4.7 Grad, div and curl applied to products of functions -- 5. Integral Theorems -- 5.1 Divergence theorem -- 5.2 Stokes's theorem -- 6. Curvilinear Coordinates -- 6.1 Orthogonal curvilinear coordinates -- 6.2 Grad, div and curl in orthogonal curvilinear coordinate systems -- 6.3 Cylindrical polar coordinates -- 6.4 Spherical polar coordinates -- 7. Cartesian Tensors

-- 7.1 Coordinate transformations -- 7.2 Vectors and scalars -- 7.3 Tensors -- 7.4 Physical examples of tensors -- 8. Applications of Vector Calculus -- 8.1 Heat transfer -- 8.2 Electromagnetism -- 8.3 Continuum mechanics and the stress tensor -- 8.4 Solid mechanics -- 8.5 Fluid mechanics -- Solutions.

Sommario/riassunto

Vector calculus is the fundamental language of mathematical physics. It pro- vides a way to describe physical quantities in three-dimensional space and the way in which these quantities vary. Many topics in the physical sciences can be analysed mathematically using the techniques of vector calculus. These top- ics include fluid dynamics, solid mechanics and electromagnetism, all of which involve a description of vector and scalar quantities in three dimensions. This book assumes no previous knowledge of vectors. However, it is assumed that the reader has a knowledge of basic calculus, including differentiation, integration and partial differentiation. Some knowledge of linear algebra is also required, particularly the concepts of matrices and determinants. The book is designed to be self-contained, so that it is suitable for a pro- gramme of individual study. Each of the eight chapters introduces a new topic, and to facilitate understanding of the material, frequent reference is made to physical applications. The physical nature of the subject is clarified with over sixty diagrams, which provide an important aid to the comprehension of the new concepts. Following the introduction of each new topic, worked examples are provided. It is essential that these are studied carefully, so that a full un- derstanding is developed before moving ahead. Like much of mathematics, each section of the book is built on the foundations laid in the earlier sections and chapters.