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Nota di contenuto	Cover; Title Page; Copyright Page; Table of Contents; Introduction; PART 1. MOTIVATION: EXAMPLES AND APPLICATIONS; Chapter 1. Curvilinear Continuous Media; 1.1. One-dimensional curvilinear media; 1.1.1. Ideally flexible string; 1.1.1.1. The essential difficulty; 1.1.1.2. Unilateral contact; 1.1.2. The ""elastica"" problem: buckling of an inextensible beam; 1.2. Supple membranes; 1.2.1. Curvilinear coordinates and charts; 1.2.2. Metric tensor; 1.2.3. Internal efforts and constitutive law; 1.2.4. Exterior efforts; 1.2.5. Infinitesimal deformations; 1.2.6. Principle of minimum energy Chapter 2. Unilateral System Dynamics2.1. Dynamics of ideally flexible strings; 2.1.1. Propagation of discontinuities; 2.1.2. Evolution; 2.1.3. Vibrations; 2.1.3.1. Harmonic response; 2.1.3.2. Small oscillations; 2.2. Contact dynamics; 2.2.1. Evolution of a material point; 2.2.2. Evolution of deformable and non-deformable solids; 2.2.3. Granular modeling of the movement of a crowd; Chapter 3. A Simplified Model of Fusion/Solidification; 3.1. A simplified model of phase transition; Chapter 4. Minimization of a Non-Convex Function; 4.1. Probabilities,

convexity and global optimization

Chapter 5. Simple Models of Plasticity 5.1. Ideal elastoplasticity; PART 2. THEORETICAL ELEMENTS; Chapter 6. Elements of Set Theory; 6.1. Elementary notions and operations on sets; 6.2. The axiom of choice; 6.3. Zorn's lemma; Chapter 7. Real Hilbert Spaces; 7.1. Scalar product and norm; 7.2. Bases and dimensions; 7.3. Open sets and closed sets; 7.4. Sequences; 7.4.1. Dense sequences and dense sets; 7.5. Linear functionals; 7.5.1. Sequences and continuity; 7.6. Complete space; 7.6.1. The Cauchy sequence; 7.6.2. Completion of a space; 7.6.3. Baire's theorem: a property of complete spaces 7.7. Orthogonal projection onto a vector subspace 7.8. Riesz's representation theory; 7.9. Weak topology; 7.10. Separable spaces: Hilbert bases and series; Chapter 8. Convex Sets; 8.1. Hyperplanes; 8.2. Convex sets; 8.3. Convex hulls; 8.4. Orthogonal projection on a convex set; 8.5. Separation theorems; 8.6. Convex cone; Chapter 9. Functionals on a Hilbert Space; 9.1. Basic notions; 9.2. Convex functionals; 9.3. Semi-continuous functionals; 9.4. Affine functionals; 9.5. Convexification and LSC regularization; 9.6. Conjugate functionals; 9.7. Subdifferentiability; Chapter 10. Optimization 10.1. The optimization problem 10.2. Basic notions; 10.2.1. Minimizing sequences; 10.2.2. Indicator function; 10.2.3. Coerciveness; 10.3. Fundamental results; 10.3.1. Approximation; 10.3.1.1. Exterior penalty approximation; 10.3.1.2. Interior penalty approximation; 10.3.1.3. Approximation by regularization; 10.3.1.4. Duality approximation; Chapter 11. Variational Problems; 11.1. Fundamental notions; 11.1.1. Proximal elements; 11.1.2. Operators and monotony; 11.1.2.1. Monotony; 11.1.2.2. Semi-continuous operators and hemi-continuous operators; 11.1.2.3. Maximal monotone operators 11.1.2.4. Brouwer's fixed point theorem

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## Sommario/riassunto

This reference book gives the reader a complete but comprehensive presentation of the foundations of convex analysis and presents applications to significant situations in engineering. The presentation of the theory is self-contained and the proof of all the essential results is given. The examples consider meaningful situations such as the modeling of curvilinear structures, the motion of a mass of people or the solidification of a material. Non convex situations are considered by means of relaxation methods and the connections between probability and convexity are explored and exploited in o

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