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Nota di contenuto	1. Introduction -- 2. Phase-Lag Models -- 3. Phonon Models -- 4. Thermomass Model -- 5. Mesoscopic Moment Equations -- 6. Micro-Temperature & Micromorphic Temperature Models -- 7. Thermodynamic Models -- 8. Fractional Derivative Models -- 9. Fractional Boltzmann and Fokker-Planck equations -- 10. Elasticity and thermal expansion coupling -- 11. Some Exact Solutions -- 12. Relativistic Brownian Motion -- 13. Relativistic Boltzmann Equation -- 14. Variational Models -- 15. Relativistic Thermodynamics -- 16.

Landauer approach -- 17. Green-Kubo approach -- 18. Coherent Phonon Transport -- 19. Conclusions.

Sommario/riassunto

This book presents a broad and well-structured overview of various non-Fourier heat conduction models. The classical Fourier heat conduction model is valid for most macroscopic problems. However, it fails when the wave nature of the heat propagation becomes dominant and memory or non-local spatial effects become significant; e.g., during ultrafast heating, heat transfer at the nanoscale, in granular and porous materials, at extremely high values of the heat flux, or in heat transfer in biological tissues. The book looks at numerous non-Fourier heat conduction models that incorporate time non-locality for materials with memory, such as hereditary materials, including fractional hereditary materials, and/or spatial non-locality, i.e. materials with a non-homogeneous inner structure. Beginning with an introduction to classical transport theory, including phase-lag, phonon, and thermomass models, the book then looks at various aspects of relativistic and quantum transport, including approaches based on the Landauer formalism as well as the Green-Kubo theory of linear response. Featuring an appendix that provides an introduction to methods in fractional calculus, this book is a valuable resource for any researcher interested in theoretical and numerical aspects of complex, non-trivial heat conduction problems.