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Sommario/riassunto

In two volumes, this book presents a detailed, systematic treatment of electromagnetics with application to the propagation of transient electromagnetic fields (including ultrawideband signals and ultrashort pulses) in dispersive attenuative media. The development in this expanded, updated, and reorganized new edition is mathematically rigorous, progressing from classical theory to the asymptotic description of pulsed wave fields in Debye and Lorentz model dielectrics, Drude model conductors, and composite model semiconductors. It will be of use to researchers as a resource on electromagnetic radiation and wave propagation theory with applications to ground and foliage penetrating radar, medical imaging, communications, and safety issues associated with ultrawideband pulsed fields. With meaningful exercises, and an authoritative selection of topics, it can also be used as a textbook to prepare graduate students for research. Volume 2 presents a detailed asymptotic description of plane wave pulse propagation in dielectric, conducting, and semiconducting materials as described by the classical Lorentz model of dielectric resonance, the Rocard-Powles-Debye model of orientational polarization, and the Drude model of metals. The rigorous description of the signal velocity of a pulse in a dispersive material is presented in connection with the question of superluminal pulse propagation. The second edition contains new material on the effects of spatial dispersion on precursor formation, and pulse transmission into a dispersive half space and into multilayered media. Volume 1 covers spectral representations in temporally dispersive media.