

A Foundation in Digital Communication

Lapidoth, Amos. *A Foundation in Digital Communication*. New York, NY: Cambridge University Press, 2009, 723 pp. \$70.00 (Hardbound).

This intuitive but rigorous introduction derives the core results and engineering schemes of digital communication from first principles. Theory, rather than industry standards, motivates the engineering approaches, and key results are stated with all the required assumptions.

The book emphasizes the geometric view, opening with the inner product, the matched filter for its computation, Parseval's theorem, the sampling theorem as an orthonormal expansion, the isometry between passband signals and their baseband representation, and the spectral-efficiency optimality of quadrature amplitude modulation (QAM). Subsequent chapters address noise, with a comprehensive study of hypothesis testing, Gaussian stochastic processes, the sufficiency of the matched filter outputs, and some coding theory.

New is a treatment of white noise without generalized functions and a presentation of the power spectral density without artificial random jitters and random phases in the analysis of QAM.

This systematic and insightful book – with over 300 exercises – is ideal for graduate courses in digital communication, and for anyone asking "why" and not just "how".

Amos Lapidoth received his Ph.D. in electrical engineering from Stanford University. He was an assistant and associate professor at the Massachusetts Institute of Technology, and is currently Professor of Information Theory at ETH Zürich, the Swiss Federal Institute of Technology. He is a Fellow of the IEEE.