

Digital Communications

Fourth Edition

John G. Proakis

**Digital
Communications**

Fourth Edition

Proakis



TK
5103.7
.P76
2001

MC
**Graw
Hill**

PENN STATE UNIVERSITY LIBRARIES



A000054535237

A classic in the field, *Digital Communications* makes an excellent graduate-level comprehensive reference book for the professional. This new edition maintains the strengths of earlier editions with its comprehensive coverage, accuracy, and excellent explanations. It continues to provide the flexible organization that makes this book a good fit for a one- or two-semester course. Features of the new edition of *Digital Communications* include:


- Complete and thorough introduction to the analysis and design of digital communication systems that makes this book a *must-have* reference.
- Flexible organization that makes it useful in a one- or two-semester course.
- Excellent end-of-chapter problems that challenge the student.
- An accompanying website that provides presentation material and solutions for instructors.

This new edition of John Proakis' best-selling *Digital Communications* is up to date with new coverage of current trends in the field. New topics have been added that include:

- Serial and Parallel Concatenated Codes
- Punctured Convolutional Codes
- Turbo TCM
- Turbo Equalization
- Spatial Multiplexing
- Digital Cellular CDMA System Based on DS Spread Spectrum
- Reduced Complexity ML Detectors

The new website offers electronic versions of text figures that are great for creating presentation materials for your course.

Visit the website at
www.mhhe.com/engcs/electrical/proakis

McGraw-Hill Higher Education 
A Division of The McGraw-Hill Companies

ISBN 0-07-232111-3



90000

9 780072 321111

www.mhhe.com

Digital Communications


Fourth Edition

JOHN G. PROAKIS

*Department of Electrical and Computer Engineering
Northeastern University*



Boston Burr Ridge, IL Dubuque, IA Madison, WI New York San Francisco St. Louis
Bangkok Bogotá Caracas Lisbon London Madrid Mexico City Milan
New Delhi Seoul Singapore
Sydney Taipei Toronto

McGraw-Hill Higher Education 

A Division of The McGraw-Hill Companies

DIGITAL COMMUNICATIONS

Published by McGraw-Hill, an imprint of The McGraw-Hill Companies, Inc., 1221 Avenue of the Americas, New York, NY, 10020. Copyright © 2001, 1995, 1989, 1983, by The McGraw-Hill Companies, Inc. All rights reserved. No part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written consent of The McGraw-Hill Companies, Inc., including, but not limited to, in any network or other electronic storage or transmission, or broadcast for distance learning. Some ancillaries, including electronic and print components, may not be available to customers outside the United States.

This book is printed on acid-free paper.

4 5 6 7 8 9 0 DOC/DOC 0 9 8 7 6 5 4 3

ISBN 0-07-232111-3

Publisher: *Thomas Casson*
Sponsoring editor: *Catherine Fields Shultz*
Developmental editor: *Emily J. Gray*
Marketing manager: *John Wannemacher*
Project manager: *Craig S. Leonard*
Production supervisor: *Rose Hepburn*
Senior designer: *Kiera Cunningham*
New media: *Christopher Styles*
Compositor: *Interactive Composition Corporation*
Typeface: *10.5/12 Times Roman*
Printer: *Quebecor World Fairfield, Inc.*

Library of Congress Cataloging-in-Publication Data

Proakis, John G.

Digital communications / John G. Proakis.—4th ed.

p. cm.

ISBN 0-07-232111-3

1. Digital communications. I. Title.

TK5103.7.P76 2000

621.382—dc21

00-025305

www.mhhe.com

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.