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Data Communications for Engineers

C. G. Guy

*Department of Engineering
University of Reading*

**Macmillan New Electronics
Introductions to Advanced Topics**

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Series Editor's Foreword

The rapid development of electronics and its engineering applications ensures that new topics are always competing for a place in university and polytechnic courses. But it is often difficult for lecturers to find suitable books for recommendation to students, particularly when a topic is covered by a short lecture module, or as an option.

Macmillan New Electronics offers introductions to advanced topics. The level is generally that of second and subsequent years of undergraduate courses in electronic and electrical engineering, computer science and physics. Some of the authors will paint with a broad brush; others will concentrate on a narrower topic, and cover it in greater detail. But in all cases the titles in the Series will provide a sound basis for further reading of the specialist literature, and an up-to-date appreciation of practical applications and likely trends.

The level, scope and approach of the Series should also appeal to practising engineers and scientists encountering an area of electronics for the first time, or needing a rapid and authoritative update.

Paul A. Lynn

Preface

The ability for computers to communicate with each other has advanced very rapidly in the past decade. It has been a principal driving force behind the information technology revolution. It is now standard practice for an organisation to link all its computing resources into a network, or series of interconnected networks, in order to provide advantages such as access to centralised resources, electronic mail and many others.

There are many books on the market which are called something like *data communications*, but they are mostly aimed at computer scientists. They tend to gloss over the methods and inherent problems in the physical transport of data, and concentrate on the programming aspects of computers communicating with one another. Conversely there are even more books which are called something like *digital communications* which are aimed at electronic engineers. These usually include a vast amount of mathematically complex theory, providing a good basis for understanding how any digital link could be set up, but tend to skim over the realities of connecting computers together.

The principal aim of this book is to attempt to bridge that gap; to set a study of the engineering mechanisms for data transfer in the context of data communications, as the term is used by computer scientists. This has, of necessity, involved a number of compromises. A great deal of the mathematical aspects of communications theory has had to be omitted, but this may be no bad thing as the principles can be appreciated without having to wade through acres of integrals! On the other hand, the details of programming for data communications have also been omitted. Throughout, the emphasis is on a systems approach, attempting to provide a guide to the subject, which could then be taken further in the direction of engineering or of computer science, if required.

The book could be used to support an introductory course in digital communications at the second or third year level of an engineering degree course. It could also be used as a support text for computer science courses in data communications. In addition, it could be used by practising engineers, familiar with communications but wishing to update their knowledge in an expanding area.

The information presented in the book is based on a series of lectures developed for the third year of the Electronic Engineering degree course at the University of Reading. The original sources are a wide variety of books from both ends of the data communications spectrum, the more up-to-date of which are listed in the bibliography.

I would like to thank the series editor, Paul Lynn, for his early encouragement and his constructive comments during the preparation of the manuscript, and Malcolm Stewart, of Macmillan Education, for all his assistance. I would also like to thank Professor D.G. Smith, from the University of Strathclyde, for his detailed and helpful review of the first draft of this book. Of course, I must offer the most sincere thanks to my family, Elaine, Richard and David, for all their help and encouragement.