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Information and Communication for Engineers

M.J. Usher and C.G. Guy

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Preface

This book is based on an earlier text first published in 1984 and entitled: *Information Theory for Information Technologists*. That text was intended to provide a clear and thorough account of the principles of Information Theory in a manner suitable for students studying first degree courses in electronic engineering, cybernetics, control engineering, and telecommunications. Although the title was appropriate at the time, ‘information technology’ has since become a much ‘softer’ subject that is now studied by many students with more limited backgrounds in mathematics and physics; for this reason some sections of the book (for example, Chapter 2 and the appendices) may be unsuitable for such persons. However, the general treatment of information and its quantification (Chapter 1) and coding (Chapter 3) are relatively non-mathematical and should therefore provide a useful introduction for a wide class of readers. Since nowadays the subjects of information and communication cannot sensibly be separated, the book’s title *Information and Communication for Engineers* both underlines this and reflects the intended readership.

In a book of this content the basic ideas about quantity of information must clearly come first, and four chapters from the original text have been combined into the new Chapter 1 entitled ‘Information and its Quantification’. Some of the elementary mathematics on probability theory now appears in an appendix to avoid any disturbance to the flow of the book caused by a sudden excursion into mathematics with which some readers may already be familiar.

When information is to be transmitted, it is always in the form of some type of signal, so Chapter 2 is entitled ‘Signals’. As it stands, it would provide useful introductory reading for a stand-alone course on signal theory. There is a substantial section on Fourier Theory, but Fourier Series are covered in an appendix. As explained in the book, Fourier Series are useful as an introduction to Fourier Theory, but once Fourier Transforms have been mastered, they become totally redundant. There are sections on the discrete and fast transforms, together with a short section on oversampling and noise shaping. Discussion of electrical noise is also included in an appendix.

It is explained in the book that when a signal is to be transmitted it is rarely in a suitable form and has to be modified in some way. Chapter 3 is entitled ‘Coding’ and includes discussion of Shannon’s first and second theorems for coding. It provides a comprehensive treatment of the topic, including error detection and correction, and data compression techniques for text, speech and images.

Having encoded the information the next step is, of course, to transmit it and Chapter 4 is entitled 'Communication'. Again, a comprehensive treatment is provided, with sections on digital modulation, line codes and data communications.

The final chapter is entitled 'Applications'. This includes discussion of topics such as telephone and TV channels, as well as Teletext, FAX, CDs and computer networks. The aim is to show how some of the basic ideas of Information Theory have now found application in modern technology.

The book contains many worked examples together with examples for solution in each chapter, and with worked solutions at the end of the book.

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