

Preface

By inventing the wireless transmitter or radio in 1897, the Italian physicist Tomaso Guglielmo Marconi added a new dimension to the world of communications. This enabled the transmission of the human voice through space without wires. For this epoch-making invention, this illustrious scientist was honored with the Nobel Prize for Physics in 1909. Even today, students of wireless or radio technology remember this distinguished physicist with reverence. A new era began in Radio Communications.

The classical Marconi radio used a modulation technique known today as “Amplitude Modulation” or just AM. This led to the development of Frequency Modulation (FM), amplitude shift keying (ASK), phase shift keying (PSK), etc. Today, these technologies are extensively used in various wireless communication systems. These modulation techniques form an integral part of academic curricula today.

This book presents a comprehensive overview of the various modulation techniques mentioned above. Numerous illustrations are used to bring students up-to-date in key concepts and underlying principles of various analog and digital modulation techniques. In particular, the following topics will be presented in this book:

- Amplitude Modulation (AM)
- Frequency Modulation (FM)
- Bandwidth occupancy in AM and FM
- Amplitude shift keying (ASK)
- Frequency shift keying (FSK)
- Phase shift keying (PSK)
- N-ary coding and M-ary modulation
- Bandwidth occupancy in ASK, FSK, and PSK

This text has been primarily designed for electrical engineering students in the area of telecommunications. However, engineers and designers working in the area

of wireless communications would also find this text useful. It is assumed that the student is familiar with the general theory of telecommunications.

In closing, I would like to say a few words about how this book was conceived. It came out of my long industrial and academic career. During my teaching tenure at the University of North Dakota, I developed a number of graduate-level elective courses in the area of telecommunications that combine theory and practice. This book is a collection of my courseware and research activities in wireless communications.

I am grateful to UND and the School for the Blind, North Dakota, for affording me this opportunity. This book would never have seen the light of day had UND and the State of North Dakota not provided me with the technology to do so. My heartfelt salute goes out to the dedicated developers of these technologies, who have enabled me and others visually impaired to work comfortably.

I would like to thank my beloved wife, Yasmin, an English Literature buff and a writer herself, for being by my side throughout the writing of this book and for patiently proofreading it. My darling son, Shams, an electrical engineer himself, provided technical support in formulation and experimentation when I needed it. For this, he deserves my heartfelt thanks.

Finally, thanks are also to my doctoral student Md. Maruf Ahamed who found time in his busy schedule to assist me with the simulations, illustrations, and the verification of equations.

In spite of all this support, there may still be some errors in this book. I hope that my readers forgive me for them. I shall be amply rewarded if they still find this book useful.

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