

*Second Edition*

**MICROPROCESSORS**  
**and**  
**MICROCOMPUTER-BASED**  
**SYSTEM DESIGN**

**DR. M. RAFIQUZZAMAN**

*Second Edition*

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**MICROPROCESSORS  
and  
MICROCOMPUTER-BASED  
SYSTEM DESIGN**

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**MOHAMED RAFIQUZZAMAN, PH.D.**

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Professor

California State Polytechnic University  
Pomona, California

and

Adjunct Professor

University of Southern California  
Los Angeles, California



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## Preface

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This book is based on the fundamental concepts associated with typical 8-, 16-, and 32-bit microprocessors and microcomputers. These concepts are related in detail to the Intel 8085/8086/80386/80486/80960 and Motorola 68000/68020/68030/88100. A brief coverage of Intel Pentium, Motorola 68040, Motorola/IBM/Apple PowerPC, and DEC's Alpha is also included.

With the growing popularity of both Intel and Motorola 32-bit microprocessors, it is now necessary to cover these processors at the undergraduate and graduate levels. Therefore, a thorough coverage of these processors is provided.

A detailed treatment of Intel 80386 and Motorola 68020/68030 along with more examples and system design concepts is included. Programming and system design concepts associated with other popular 32-bit microprocessors such as Intel 80486/80960 and Motorola 68040 are also covered in this book. Finally, an overview of Intel Pentium microprocessor is provided. Since the fundamental concept of 8-bit microprocessors, along with the Intel 8085, has proved its worth many times over in the intervening years, the 8085 has been retained in this edition.

This book is divided into ten chapters. Chapter 1 contains the basics of microprocessors, as in the first edition. New topics such as floating-point arithmetic, Program Array Logic (PAL) used for address decoding for 32-bit microprocessors, flash memories and an overview of various 32-bit microprocessors is also included.

Chapter 2 covers details of the 8085 microprocessor.

Chapters 3 through 8 provide detailed descriptions of the architectures, addressing modes, instruction sets, I/O and system design concepts of Intel's 8086, 80386, 80486, and 80960 and Motorola's 68000, 68020, 68030, 68040, and 88100 microprocessors. An overview of Intel 80186, 80286, Pentium and PowerPC microprocessors are also included.

Chapter 9 contains fundamentals of peripheral interfacing.

Chapter 10 includes system design concepts along with the applications of design principles covered in the preceding chapters. Three system design examples using the 8085, 8086, and 68000 are included in detail.

The appendices include materials on the HP 64000 microcomputer development systems, data sheets on various microprocessors and support chips, and a glossary.

The audience of this book can be college students or practicing microprocessor system designers in the industry. It can be used as an undergraduate or graduate text in electrical engineering, computer engineering or computer science. Practitioners of microprocessor system design in the industry will find greater detail and comparison considerations than are found in manufacturers' manuals. The book assumes a familiarity with digital logic and topics such as Boolean Algebra and K-maps.

The author wishes to express his sincere appreciation to his student Frank Lee for making constructive suggestions and typing the manuscript. The author is also grateful to Dr. W.C. Miller of University of Windsor, Canada, and others for their support throughout the writing effort.

Mohamed Rafiqzaman  
Pomona, California

## The Author

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Mohamed Rafiquzzaman obtained his Ph.D. in Electrical Engineering in Canada in 1974. He worked for Esso/Exxon and Bell Northern Research for approximately 5 years. Dr. Rafiquzzaman is presently a professor of electrical and computer engineering at California State Polytechnic University, Pomona. He was Chair of the department there from 1984 to 1985. Dr. Rafiquzzaman is also an adjunct professor of electrical engineering systems at the University of Southern California, Los Angeles. He consulted for ARCO, Rockwell, Los Angeles County, and Parsons Corporation in the areas of computer applications. He has published six books on computers, which have been translated into Russian, Chinese and Spanish, and has published numerous papers on computers.

Dr. Rafiquzzaman is the founder of Rafi Systems, Inc. a manufacturer of biomedical devices and computer systems consulting firm in California. In 1984, he managed the Olympic Swimming, Diving and Synchronized Swimming teams. He has also managed Swiss timing, scorekeeping, and computer systems.

From 1984 to 1989, he was the instructor for Motorola in Southern California teaching short courses on 68000, 68020, and 68030 for local industries.

Dr. Rafiquzzaman was an advisor to the President of Bangladesh on computers from 1988 to 1990. He is currently involved in research activities in both hardware and software aspects of typical 16- and 32-bit microprocessor-based applications. These activities include image processing, robotics control, and OCR (Optical Character Recognition).

*To my parents,  
my wife Kusum, son Tito,  
and brother Elan*

*In memory of my brother, Dr. M. Kaisaruzzaman*

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