

Don Cassel • Martin Jackson

INTRODUCTION TO COMPUTERS AND INFORMATION PROCESSING



with BASIC-COBOL-FORTRAN-PASCAL

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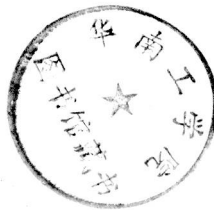
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Introduction to Computers
and Information Processing

In memory of my father,
Kenneth W. Cassel

Don Cassel

To Kelly
Happiness is a bright enthusiastic smile.

Martin Jackson

Preface

As the title of this book indicates, this is an introduction to computers and not an exhaustive treatment. Although we have attempted to cover the major facets of information processing, it is virtually impossible to discuss so vast a subject in the limited space available in a textbook.

To assist in our decision of what to put in and what to leave out, our publishers generously financed a survey of computer educators to try to identify the subject matter which is of major importance to today's data processing student. As a result, we feel that this is a book which is both current and practical. In addition to discussing the traditional data processing subjects, we have included major chapters on mini- and microcomputers, systems analysis and design, data base, and data communication.

The book is divided into five sections, each dealing with a major concept. Our intention here is that a well-rounded course may be developed on this pattern. If time permits, say a two-semester course, all chapters in each section may be covered. For lighter courses, appropriate chapters may be selected from each section. These sections are as follows:

A A Guide To Computers

This section provides an overview of various concepts which serve as a foundation for later chapters. In this section is a discussion of computers and what they are, followed by a historical chapter. Unit record devices are included

as part of the history chapter, reflecting their position in the industry today. The section ends with chapters on number systems (where mathematical and computer codes are explained) and a general explanation of computing concepts.

B Computer Hardware

This section covers devices as other introductory books do but with a few exceptions. One is the attempt to incorporate all of the important new methods of data entry. These methods include key tape and disk, central collection, and point of sale terminals. A second major consideration is the concept of file organization. With tape and disk files, we discuss sequential, direct, indexed, and virtual file organization.

A major chapter is included on a fast-growing segment of the computer market—mini- and microcomputers. In this chapter, we discuss the technology, application, and use of these computers.

Throughout Section B, each of these subjects is discussed using examples from the latest computers and peripheral devices.

C Computer Programming

Naturally, any course in information processing should expose the student to some programming. This section begins with problem solving methods ranging from flowcharting to the current technology of top-down development, pseudo code, structured programming, and the chief programmer team.

A chapter with sections on BASIC, COBOL, FORTRAN, and PASCAL is included to reflect the most popular languages used in introductory courses. Each of these language sections contains sufficient material and exercises to give meaningful programming experiences to the student.

D Systems Analysis and Design

This section recognizes that, in the 1980s, the ability to design systems will become equal to, and possibly surpass, the ability to write programs. A well-rounded education in information processing demands strength in understanding systems and their design, implementation, and operation. These subjects are examined in turn and then merged into a discussion of accounts receivable, inventory, word processing, and payroll systems.

E Advanced Concepts

The book ends with a treatment of some highly important subjects for the modern data processor. Current topics on operating systems, data communications, and data base are considered at a level comprehensible to the introductory student.

During the numerous times we have taught introductory courses to first-

year college students, we have recognized that a major concern is learning the terminology of computers and information processing. Naturally, a book of this type is full of new terms which a student must learn. In addition, one term must often be described in terms of another. To help with this problem, we have incorporated the "Key Concept," which is used as needed to describe terms as they occur. In addition, a list of key terms is included at the end of each chapter to identify terms which the student should know.

Each chapter also includes questions and exercises to help the student acquire a working knowledge of the material and to prepare for tests and examinations. These exercises appear at the end of the chapter except in programming chapters, where exercises are strategically located throughout the chapter.

As a further aid to study and interest as well as to instill an appreciation for the vastness of the subject, most chapters have a page on problems for research and discussion. Some of these problems can be used for independent study or assignments. In other cases, they would be excellent for a team project or for classroom discussion. It is hoped that they will stimulate ideas that make the subject more interesting and exciting.

There are many people who have contributed in various ways to this book. We would like to thank the many unnamed individuals who participated in the initial survey and gave us some direction in writing the book. We appreciated the time and effort on the part of our reviewers, who not only pointed out the little inconsistencies and irregularities in the manuscript but also gave us so much encouragement. Ed Koen of Seneca College, Sylvia Ciuciura of Centennial College, Bob Condon of Westchester Community College, and Mario Farina of General Electric deserve a sincere thank you.

Finally, thanks to our Editor, Ben Wentzell, whose help in the project and continual encouragement has assisted us over the duration of writing the book.

*Don Cassel
Martin Jackson*

Introduction to Computers and Information Processing

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Section A

A Guide to Computers

1

Introduction

We are in the midst of a revolution: the Computer Revolution. It is destined to overshadow even the Industrial Revolution which gave us electricity, global communication, the automobile, and the airplane. It has immensely affected the lives of every person, not only in the industrialized nations but even in the Third World countries, around our globe. What kind of future this is leading to is at best the speculation of futurists and science fiction writers.

Over the past twenty years the prices of computers have decreased dramatically and the performance in terms of speed and data capacity has increased spectacularly. James Martin in *The Computerized Society* shows these factors to be expanding at a logarithmic rate. Speed has increased 10 fold every five years from 1955 to 1980. If this continues, we can expect another order of magnitude increase by 1985. What does this mean in everyday terminology? If the population of the United States grew at this rate and we assumed a population of 160 million people in 1955, then by 1975 there would have been 1.6 trillion people and by 1985 the population would grow to 160 trillion. The capacity for storing data in the computer system has increased at a similar rate. Whether computer performance will continue to improve at such a rate is anyone's guess, but the impact of what has already occurred will have a lasting influence on this planet.

Influence In Our Daily Lives

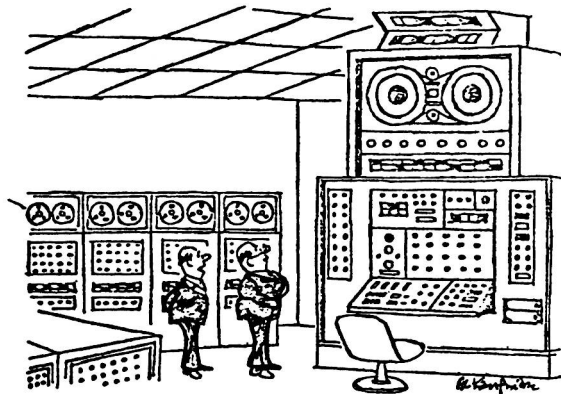
The computer influences your life to a far greater extent than might be imagined. You may be awakened in the morning by music from the digital alarm

clock/radio, the circuitry of which was designed by a computer and uses computer technology for the miniaturization of its components. The music heard may have been selected and organized into the morning program with the aid of a computer.

The morning paper delivered to the door was produced while you slept using computer typesetting to bring the most recent news events to you with a minimum delay and at the lowest cost. However, the computer did not write the stories, neither did it deliver the paper to your door. Creative activity is not something the computer does very well. And Johnny still does a better job of delivery than any computerized robot.

During breakfast you may look through various bills received by mail. The electric company, gas, oil, telephone, and magazine companies all send bills produced by computer. The company computer scans its customer records, determines who owes money and the amount, prints an appropriate bill, and addresses it. In some cases, the computer even stuffs the mailing envelopes. When you return the bill or its stub with a check, the stub becomes input to the computer, which updates your record showing the bill has been paid.

Your car's design has been influenced by the computer. Most major automobile manufacturers use computers to design their cars and components. Engineers with the assistance of computer programs develop style, economy, comfort, ride, handling, and cost. During assembly of a car, the computer schedules parts and labor to ensure that everything is ready at the right time. The Chevrolet Vega was built by computer. If you drive a car with fuel injection, such as a Volkswagen Rabbit or Volvo, there is even a small computer built



"It can't actually think, but when it makes a mistake, it puts the blame on some other computer."

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