

LOW PRICE EDITION

PEARSON
Education

SECOND EDITION

THE

C



PROGRAMMING
LANGUAGE

BRIAN W. KERNIGHAN
DENNIS M. RITCHIE

Contents

| | |
|---|-----------|
| Preface | ix |
| Preface to the First Edition | xi |
| Introduction | 1 |
| Chapter 1. A Tutorial Introduction | 5 |
| 1.1 Getting Started | 5 |
| 1.2 Variables and Arithmetic Expressions | 8 |
| 1.3 The For Statement | 13 |
| 1.4 Symbolic Constants | 14 |
| 1.5 Character Input and Output | 15 |
| 1.6 Arrays | 22 |
| 1.7 Functions | 24 |
| 1.8 Arguments—Call by Value | 27 |
| 1.9 Character Arrays | 28 |
| 1.10 External Variables and Scope | 31 |
| Chapter 2. Types, Operators, and Expressions | 35 |
| 2.1 Variable Names | 35 |
| 2.2 Data Types and Sizes | 36 |
| 2.3 Constants | 37 |
| 2.4 Declarations | 40 |
| 2.5 Arithmetic Operators | 41 |
| 2.6 Relational and Logical Operators | 41 |
| 2.7 Type Conversions | 42 |
| 2.8 Increment and Decrement Operators | 46 |
| 2.9 Bitwise Operators | 48 |
| 2.10 Assignment Operators and Expressions | 50 |
| 2.11 Conditional Expressions | 51 |
| 2.12 Precedence and Order of Evaluation | 52 |
| Chapter 3. Control Flow | 55 |
| 3.1 Statements and Blocks | 55 |
| 3.2 If-Else | 55 |

| | | |
|-------------------|--|------------|
| 3.3 | Else-If | 57 |
| 3.4 | Switch | 58 |
| 3.5 | Loops—While and For | 60 |
| 3.6 | Loops—Do-while | 63 |
| 3.7 | Break and Continue | 64 |
| 3.8 | Goto and Labels | 65 |
| Chapter 4. | Functions and Program Structure | 67 |
| 4.1 | Basics of Functions | 67 |
| 4.2 | Functions Returning Non-integers | 71 |
| 4.3 | External Variables | 73 |
| 4.4 | Scope Rules | 80 |
| 4.5 | Header Files | 81 |
| 4.6 | Static Variables | 83 |
| 4.7 | Register Variables | 83 |
| 4.8 | Block Structure | 84 |
| 4.9 | Initialization | 85 |
| 4.10 | Recursion | 86 |
| 4.11 | The C Preprocessor | 88 |
| Chapter 5. | Pointers and Arrays | 93 |
| 5.1 | Pointers and Addresses | 93 |
| 5.2 | Pointers and Function Arguments | 95 |
| 5.3 | Pointers and Arrays | 97 |
| 5.4 | Address Arithmetic | 100 |
| 5.5 | Character Pointers and Functions | 104 |
| 5.6 | Pointer Arrays; Pointers to Pointers | 107 |
| 5.7 | Multi-dimensional Arrays | 110 |
| 5.8 | Initialization of Pointer Arrays | 113 |
| 5.9 | Pointers vs. Multi-dimensional Arrays | 113 |
| 5.10 | Command-line Arguments | 114 |
| 5.11 | Pointers to Functions | 118 |
| 5.12 | Complicated Declarations | 122 |
| Chapter 6. | Structures | 127 |
| 6.1 | Basics of Structures | 127 |
| 6.2 | Structures and Functions | 129 |
| 6.3 | Arrays of Structures | 132 |
| 6.4 | Pointers to Structures | 136 |
| 6.5 | Self-referential Structures | 139 |
| 6.6 | Table Lookup | 143 |
| 6.7 | Typedef | 146 |
| 6.8 | Unions | 147 |
| 6.9 | Bit-fields | 149 |
| Chapter 7. | Input and Output | 151 |
| 7.1 | Standard Input and Output | 151 |
| 7.2 | Formatted Output—Printf | 153 |

| | | |
|--------------------|---|------------|
| 7.3 | Variable-length Argument Lists | 155 |
| 7.4 | Formatted Input—Scanf | 157 |
| 7.5 | File Access | 160 |
| 7.6 | Error Handling—Stderr and Exit | 163 |
| 7.7 | Line Input and Output | 164 |
| 7.8 | Miscellaneous Functions | 166 |
| Chapter 8. | The UNIX System Interface | 169 |
| 8.1 | File Descriptors | 169 |
| 8.2 | Low Level I/O—Read and Write | 170 |
| 8.3 | Open, Creat, Close, Unlink | 172 |
| 8.4 | Random Access—Lseek | 174 |
| 8.5 | Example—An Implementation of Fopen and Getc | 175 |
| 8.6 | Example—Listing Directories | 179 |
| 8.7 | Example—A Storage Allocator | 185 |
| Appendix A. | Reference Manual | 191 |
| A1 | Introduction | 191 |
| A2 | Lexical Conventions | 191 |
| A3 | Syntax Notation | 194 |
| A4 | Meaning of Identifiers | 195 |
| A5 | Objects and Lvalues | 197 |
| A6 | Conversions | 197 |
| A7 | Expressions | 200 |
| A8 | Declarations | 210 |
| A9 | Statements | 222 |
| A10 | External Declarations | 225 |
| A11 | Scope and Linkage | 227 |
| A12 | Preprocessing | 228 |
| A13 | Grammar | 234 |
| Appendix B. | Standard Library | 241 |
| B1 | Input and Output: <stdio.h> | 241 |
| B2 | Character Class Tests: <ctype.h> | 248 |
| B3 | String Functions: <string.h> | 249 |
| B4 | Mathematical Functions: <math.h> | 250 |
| B5 | Utility Functions: <stdlib.h> | 251 |
| B6 | Diagnostics: <assert.h> | 253 |
| B7 | Variable Argument Lists: <stdarg.h> | 254 |
| B8 | Non-local Jumps: <setjmp.h> | 254 |
| B9 | Signals: <signal.h> | 255 |
| B10 | Date and Time Functions: <time.h> | 255 |
| B11 | Implementation-defined Limits: <limits.h> and <float.h> | 257 |
| Appendix C. | Summary of Changes | 259 |
| Index | | 263 |