

Professor emeritus Dr. Dušan Regodić, M.Sc. OSNOVI KOMPJUTERSKE TEHNOLOGIJE (FUNDAMENTALS OF COMPUTER TECHNOLOGY)

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The textbook *Fundamentals of Computer Technology* by Professor Emeritus Dr. Dušan Regodić, M.Sc., is a foundational work intended for students of Information Technology at the University “MB.” The book covers key computing concepts, from basic mathematical principles to modern computer architectures and networks. It was published by *Planeta Print, Belgrade*, in 2024, as part of the University “MB” Mid-Term Plan for Educational Literature Development. ISBN 978-86-6375-150-7 15/052024. The book consists of 12 chapters spanning 451 pages.

KEY FEATURES OF THE BOOK:

- *Comprehensive Approach* – Covers both hardware and software aspects of computer technology.
- *Theoretical and Practical Application* – Explains mathematical foundations, logic circuits, and computer architecture.
- *Current Topics* – Includes modern concepts such as cloud computing, embedded systems, and network security.
- *Student-Friendly* – Features review questions, examples, and exercises for practice.



STRUCTURE AND CONTENT BY CHAPTER:

1. INTRODUCTION TO COMPUTER TECHNOLOGY FUNDAMENTALS

The preface outlines the book's objectives and study methodology. It defines key terms such as informatics, data, and information, distinguishing between data and information while explaining the role of computers in information processing. Study recommendations are provided for efficient learning. This

chapter is essential for beginners, as its definitions are frequently referenced later.

2. HISTORICAL DEVELOPMENT OF COMPUTING

Covers the evolution of computing machines—from early devices (Abacus, Babbage's Analytical Engine, ENIAC) to modern digital systems (transistors, integrated circuits). Discusses Von Neumann architecture, the microprocessor revolution, and types of modern computers (supercomputers, mainframes, servers, workstations, PCs). Special focus is given to:

- *Personal Computers (PCs)* – Classification (desktop, laptop, tablet).
- *Embedded and Specialized Computers* (IoT, smart devices).
- *Networking and the Internet Revolution* (LAN/WAN, TCP/IP).
- *Computers in Daily Life* (industry, medicine, entertainment).
- *Maintenance and Upgrades* (hardware management, security risks, and technological obsolescence).

3. MATHEMATICAL FOUNDATIONS OF COMPUTER TECHNOLOGY INTRODUCES POSITIONAL NUMBER SYSTEMS (DECIMAL, BINARY, OCTAL, HEXADECIMAL), WITH SPECIAL EMPHASIS ON:

Binary System (arithmetic operations).

- *Hexadecimal System* (programming and memory addressing).
- *Data Representation* (integers, floating-point, IEEE 754 standard, ASCII, Unicode).
- *Conversion Between Number Systems* (algorithms and examples).

This is a crucial chapter for programmers and engineers

4. DATA REPRESENTATION IN COMPUTERS

Covers: *Numeric Data* (signed/unsigned integers, floating-point errors); *Character Data* (ASCII, EBCDIC, UTF-8); *Sound*

(digitalization, PCM, MP3); *Images* (raster/vector graphics, RGB, CMYK) and *Video* (compression, H.264, MPEG). Useful for *multimedia applications and signal processing*.

5. LOGIC ELEMENTS

Discusses: *Boolean Algebra* (basic operations, laws); *Logic Gates* (AND, OR, NOT, NAND, NOR, XOR, XNOR) and *Function Minimization* (Karnaugh maps, De Morgan's laws). Includes practical exercises critical for digital electronics.

6. LOGIC FUNCTIONS AND SWITCHING NETWORKS

Explains: *Combinational Circuits* (multiplexers, decoders, adders) and *Sequential Circuits* (registers, counters, memory units). *Essential for hardware design*.

7. COMPUTER ARCHITECTURE

Covers: *CPU* (ALU, control unit, cache memory); *Memory Hierarchy* (RAM, ROM, HDD, SSD) and *Buses and I/O Devices*. *Fundamental for understanding modern computers*.

8. COMPUTER ARCHITECTURE (DETAILED)

Examines: **Central Processing Unit (CPU)** – Functions, memory, peripherals; **Motherboard & Chassis** – Types (desktop, tower, rack), cooling; **Memory Systems** (HDD, SSD, USB flash, optical disks, cache hierarchy); **Buses & Ports** (PCIe, SATA, USB, HDMI, Thunderbolt); **Chipset & Firmware** (Northbridge/Southbridge, BIOS/UEFI) and **Key Concepts**: Von Neumann vs. Harvard architecture, memory hierarchy (registers → cache → RAM → disk), HDD vs. SSD comparison.

9. CENTRAL PROCESSING UNIT (CPU) IN DEPTH

Details: **Instruction Execution** (Fetch-Decode-Execute cycle); **Pipeline Processing** (parallel execution); **CPU Structure** (registers, ALU, FPU) and **Machine Programming**

(addressing modes, instruction set: MOV, ADD, JMP, INT).

10. PROCESSOR REGISTERS AND ADDRESSING

Covers: *Register Types* (control, status flags); *Addressing Modes* (immediate, direct, indirect, relative); *Instruction Set* (arithmetic, logical, jump operations).

11. COMPUTER SOFTWARE

Discusses: *Software Types* (application, system, OS); *OS Functions* (process management, memory allocation, file systems); *Security* (malware protection, firewalls, encryption).

12. COMPUTER NETWORKS

Explores: Networking Basics (LAN, WAN, PAN, MAN); Models (OSI 7-layer, TCP/IP); Network Hardware (switches, routers, cables, Wi-Fi, 5G).

How to Best Use This Book?

1. For Hardware Engineers – Focus on Ch. 8-9 (CPU, memory).
2. For Programmers – Study Ch. 10 (registers, assembly).
3. For System Admins – Prioritize Ch. 11-12 (OS, networks).

Who Is This Book For?

– IT Students – Covers all computing fundamentals.

- Electronics Engineers – Explains digital logic in detail.
- Programmers – Provides insights into hardware constraints.

Best Study Approach: Read theory first (Ch. 1-4); Solve exercises (especially from Ch. 3, 5, 6); Connect concepts (e.g., how binary numbers are used in CPU operations) and Use additional tools (logic circuit simulators, assemblers).

Most Important Chapters:

1. Chapter 3 (Number Systems) – Critical for programmers.
2. Chapters 5-6 (Logic Circuits) – Foundation for digital electronics.
3. Chapters 8-9 (CPU Architecture) – Essential for system programming.

Conclusion: This book is an indispensable reference for anyone seeking an in-depth understanding of computer technology. Its combination of theory and practical examples makes it ideal for academic study.

Recommendation: Perfect for students and professionals who want a deep grasp of computer technology, from digital logic to advanced architectural concepts. Its balance of theory and practice makes it valuable for future engineers and programmers alike.