computer science

The Elements of Computing Systems
Building a Modern Computer from First Principles
Nand to Tetris Companion
Noam Nisan and Shimon Schocken

In the early days of computer science, the interactions of hardware, software, compilers, and operating systems were simple enough to allow students to see an overall picture of how computers worked. With the increasing complexity of computer technology and the resulting specialization of knowledge, such clarity is often lost. Unlike other texts that cover only one aspect of the field, The Elements of Computing Systems gives students an integrated and rigorous picture of applied computer science through the construction of a simple yet powerful computer system.

Indeed, the best way to understand how computers work is to build one from scratch, and this textbook leads students through twelve chapters and projects that gradually build a basic hardware platform and a modern software hierarchy from the ground up. In the process, the students gain hands-on knowledge of hardware architecture, operating systems, programming languages, compilers, data structures, algorithms, and software engineering. Using this constructive approach, the book exposes a significant body of computer science knowledge and demonstrates how theoretical and applied techniques taught in other courses fit into the overall picture.

The book's website provides the tools and material necessary to build all the hardware and software systems described in the text, including two hundred test programs for the twelve projects. The projects and systems can be modified to meet various teaching needs, and all the supplied software is open-source.

Visit the book's website at www.nand2tetris.org.

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"A refreshingly new way of looking at computer systems as a whole by considering all aspects of a complete system in an integrated manner."
—Jonathan Bowen, *Times Higher Education Supplement*

"*The Elements of Computing Systems* has a remarkable assemblage of virtues: it's a book that covers systems at basically every level, it's appropriately minimal and lines out just enough to study in each one, it's clearly written and well-illustrated, there is a nice supply of accompanying cross-platform software available for free online, and the exercises are fun to do... Really, I'm embarrassed that I like an undergraduate computer science textbook this much."
—Nick Montfort, *Grand Text Auto*

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