Concepts in Programming Languages

This textbook for undergraduate and beginning graduate students explains and examines the central concepts used in modern programming languages, such as functions, types, memory management, and control. The book is unique in its comprehensive presentation and comparison of major object-oriented programming languages. Separate chapters examine the history of objects, Simula and Smalltalk, and the prominent languages C++ and Java.

The author presents foundational topics, such as lambda calculus and denotational semantics, in an easy-to-read, informal style, focusing on the main insights provided by these theories. Advanced topics include concurrency and concurrent object-oriented programming. A chapter on logic programming illustrates the importance of specialized programming methods for certain kinds of problems.

This book will give the reader a better understanding of the issues and trade-offs that arise in programming language design and a better appreciation of the advantages and pitfalls of the programming languages they use.

John C. Mitchell is Professor of Computer Science at Stanford University, where he has been a popular teacher for more than a decade. Many of his former students are successful in research and private industry. He received his Ph.D. from MIT in 1984 and was a Member of Technical Staff at AT&T Bell Laboratories before joining the faculty at Stanford. Over the past twenty years, Mitchell has been a featured speaker at international conferences; has led research projects on a variety of topics, including programming language design and analysis, computer security, and applications of mathematical logic to computer science; and has written more than 100 research articles. His previous textbook, *Foundations for Programming Languages* (MIT Press, 1996), covers lambda calculus, type systems, logic for program verification, and mathematical semantics of programming languages. Professor Mitchell was a member of the programming language subcommittee of the ACM/IEEE Curriculum 2001 standardization effort and the 2002 Program Chair of the ACM Principles of Programming Languages conference.

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