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*An Introduction to Mathematical Finance with Applications*  
Cambridge University Press

Taking a practical approach, this modern introduction to the theory of computation focuses on the study of problem solving through computation in the presence of realistic resource constraints. The Theory of Computation explores questions and methods that characterize theoretical computer science while relating all developments to practical issues in computing. The book establishes clear limits to computation, relates these limits to resource usage, and explores possible avenues of compromise through approximation and randomization. The book also provides an overview of current areas of research in theoretical computer science that are likely to have a significant impact on the practice of computing within the next few years.

**What Can Be Computed?** Addison Wesley

Learn the skills and acquire the intuition to assess the theoretical limitations of computer programming Offering an accessible approach to the topic, Theory of Computation focuses on the metatheory of computing and the theoretical boundaries between what various computational models can do and not do—from the most general model, the URM (Unbounded Register Machines), to the finite automaton. A wealth of programming-like examples and easy-to-follow explanations build the general theory gradually, which guides readers through the modeling and mathematical analysis of computational phenomena and provides insights on what makes things tick and also what restrains the ability of computational processes. Recognizing the importance of acquired practical experience, the book begins with the metatheory of general purpose computer programs, using URMs as a straightforward, technology-independent model of modern high-level programming languages while also exploring the restrictions of the URM language. Once readers gain an understanding of computability theory—including the primitive recursive functions—the author presents automata and languages, covering the regular and context-free languages as well as the machines that recognize these languages. Several advanced topics such as reducibilities, the recursion theorem, complexity theory, and Cook's theorem are also discussed. Features of the book include: A review of basic discrete mathematics, covering logic and induction while omitting specialized combinatorial topics A thorough development of the modeling and mathematical analysis of computational phenomena, providing a solid foundation of un-computability The connection between un-computability and un-provability: Gödel's first incompleteness theorem The book provides numerous examples of specific URMs as well as other programming languages including Loop Programs, FA (Deterministic Finite Automata), NFA (Nondeterministic Finite Automata), and PDA (Pushdown Automata). Exercises at the end of each chapter allow readers to test their comprehension of the presented material, and an extensive bibliography suggests resources for further study. Assuming only a basic understanding of general computer programming and discrete mathematics, Theory of Computation serves as a valuable book for courses on theory of computation at the upper-undergraduate level. The book also serves as an excellent resource for programmers and computing professionals wishing to understand the theoretical limitations of their craft.

Automata and Computability Prentice Hall

This highly anticipated revision builds upon the strengths of the previous edition. Sipser's candid, crystal-clear style allows students at every level to understand and enjoy this field.

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**OBJECT-ORIENTED PROGRAMMING USING C++**  
American Mathematical Soc.

This Third Edition, in response to the enthusiastic reception given

by academia and students to the previous edition, offers a cohesive presentation of all aspects of theoretical computer science, namely automata, formal languages, computability, and complexity. Besides, it includes coverage of mathematical preliminaries. **NEW TO THIS EDITION** • Expanded sections on pigeonhole principle and the principle of induction (both in Chapter 2) • A rigorous proof of Kleene's theorem (Chapter 5) • Major changes in the chapter on Turing machines (TMs) — A new section on high-level description of TMs — Techniques for the construction of TMs — Multitape TM and nondeterministic TM • A new chapter (Chapter 10) on decidability and recursively enumerable languages • A new chapter (Chapter 12) on complexity theory and NP-complete problems • A section on quantum computation in Chapter 12. • **KEY FEATURES** • Objective-type questions in each chapter—with answers provided at the end of the book. • Eighty-three additional solved examples—added as Supplementary Examples in each chapter. • Detailed solutions at the end of the book to chapter-end exercises. The book is designed to meet the needs of the undergraduate and postgraduate students of computer science and engineering as well as those of the students offering courses in computer applications.

**Elements of the Theory of Computation** John Wiley & Sons

The authors provide an introduction to quantum computing. Aimed at advanced undergraduate and beginning graduate students in these disciplines, this text is illustrated with diagrams and exercises.

**Automata, Computability and Complexity** Cambridge University Press

Now you can clearly present even the most complex computational theory topics to your students with Sipser's distinct, market-leading **INTRODUCTION TO THE THEORY OF COMPUTATION, 3E**. The number one choice for today's computational theory course, this highly anticipated revision retains the unmatched clarity and thorough coverage that make it a leading text for upper-level undergraduate and introductory graduate students. This edition continues author Michael Sipser's well-known, approachable style with timely revisions, additional exercises, and more memorable examples in key areas. A new first-of-its-kind theoretical treatment of deterministic context-free languages is ideal for a better understanding of parsing and LR(k) grammars. This edition's refined presentation ensures a trusted accuracy and clarity that make the challenging study of computational theory accessible and intuitive to students while maintaining the subject's rigor and formalism. Readers gain a solid understanding of the fundamental mathematical properties of computer hardware, software, and applications with a blend of practical and philosophical coverage and mathematical treatments, including advanced theorems and proofs. **INTRODUCTION TO THE THEORY OF COMPUTATION, 3E's** comprehensive coverage makes this an ideal ongoing reference tool for those studying theoretical computing. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

**The Theory of Computation** Springer

Introduction to the Theory of Computation Thomson/Course Technology

**An Introduction to Online Computation** John Wiley & Sons This textbook is uniquely written with dual purpose. It covers core material in the foundations of computing for graduate students in computer science and also provides an introduction to some more advanced topics for those intending further study in the area. This innovative text focuses primarily on computational complexity theory: the classification of computational problems in terms of their inherent complexity. The book contains an invaluable collection of lectures for first-year graduates on the theory of computation. Topics and features include more than 40 lectures for first year graduate students, and a dozen homework sets and exercises.

**Computability and Complexity** PHI Learning Pvt. Ltd.

This textbook explains online computation in different settings, with particular emphasis on randomization and advice complexity. These settings are analyzed for various online problems such as the paging problem, the k-server problem, job shop scheduling, the knapsack problem, the bit guessing problem, and problems on graphs. This book is appropriate for undergraduate and graduate students of computer science, assuming a basic knowledge in algorithmics and discrete mathematics. Also researchers will find this a valuable reference for the recent field of advice complexity.

*Problem Solving in Automata, Languages, and Complexity* Princeton University Press

These are my lecture notes from CS381/481: Automata and Computability Theory, a one-semester senior-level course I have taught at Cornell University for many years. I took this course

myself in the fall of 1974 as a first-year Ph.D. student at Cornell from Juris Hartmanis and have been in love with the subject ever since. The course is required for computer science majors at Cornell. It exists in two forms: CS481, an honors version; and CS381, a somewhat gentler paced version. The syllabus is roughly the same, but CS481 goes deeper into the subject, covers more material, and is taught at a more abstract level. Students are encouraged to start off in one or the other, then switch within the first few weeks if they find the other version more suitable to their level of mathematical skill. The purpose of this course is twofold: to introduce computer science students to the rich heritage of models and abstractions that have arisen over the years; and to develop the capacity to form abstractions of their own and reason in terms of them.

*A Short Introduction to Quantum Information and Quantum Computation*  
Oxford University Press

Computability and complexity theory should be of central concern to practitioners as well as theorists. Unfortunately, however, the field is known for its impenetrability. Neil Jones's goal as an educator and author is to build a bridge between computability and complexity theory and other areas of computer science, especially programming. In a shift away from the Turing machine- and Gödel number-oriented classical approaches, Jones uses concepts familiar from programming languages to make computability and complexity more accessible to computer scientists and more applicable to practical programming problems. According to Jones, the fields of computability and complexity theory, as well as programming languages and semantics, have a great deal to offer each other.

Computability and complexity theory have a breadth, depth, and generality not often seen in programming languages. The programming language community, meanwhile, has a firm grasp of algorithm design, presentation, and implementation. In addition, programming languages sometimes provide computational models that are more realistic in certain crucial aspects than traditional models. New results in the book include a proof that constant time factors do matter for its programming-oriented model of computation. (In contrast, Turing machines have a counterintuitive "constant speedup" property: that almost any program can be made to run faster, by any amount. Its proof involves techniques irrelevant to practice.) Further results include simple characterizations in programming terms of the central complexity classes PTIME and LOGSPACE, and a new approach to complete problems for NLOGSPACE, PTIME, NPTIME, and PSPACE, uniformly based on Boolean programs. Foundations of Computing series

*Models of Computation and Formal Languages* Jones & Bartlett Publishers

A Concise Introduction to Computation Models and Computability Theory provides an introduction to the essential concepts in computability, using several models of computation, from the standard Turing Machines and Recursive Functions, to the modern computation models inspired by quantum physics. An in-depth analysis of the basic concepts underlying each model of computation is provided. Divided into two parts, the first highlights the traditional computation models used in the first studies on computability: - Automata and Turing Machines; - Recursive functions and the Lambda-Calculus; - Logic-based computation models. and the second part covers object-oriented and interaction-based models. There is also a chapter on concurrency, and a final chapter on emergent computation models inspired by quantum mechanics. At the end of each chapter there is a discussion on the use of computation models in the design of programming languages. **Quantum Computing** McGraw-Hill Science, Engineering & Mathematics

"Among the many expositions of Gödel's incompleteness theorems written for non-specialists, this book stands apart. With exceptional clarity, Franzén gives careful, non-technical explanations both of what those theorems say and, more importantly, what they do not. No other book aims, as his does, to address in detail the misunderstandings and abuses of the incompleteness theorems that are so rife in popular discussions of their significance. As an antidote to the many spurious appeals to incompleteness in theological, anti-mechanist and post-modernist debates, it is a valuable addition to the literature." --- John W. Dawson, author of Logical Dilemmas: The Life and Work of Kurt Gödel

**Classical and Quantum Computation** McGraw-Hill Education

Introduction to Languages and the Theory of Computation is an introduction to the theory of computation that emphasizes formal languages, automata and abstract models of computation, and computability; it also includes an introduction to computational complexity and NP-completeness. Through the study of these topics, students encounter profound computational questions and are introduced to topics that will have an ongoing impact in computer science. Once students have seen some of the many diverse technologies contributing to computer science, they can also begin to appreciate the field as a coherent discipline. A distinctive feature of this text is its gentle and gradual introduction of the necessary mathematical tools in the context in which they are used. Martin takes advantage of the clarity and precision of mathematical language but also provides discussion and examples that make the language

intelligible to those just learning to read and speak it. The material is designed to be accessible to students who do not have a strong background in discrete mathematics, but it is also appropriate for students who have had some exposure to discrete math but whose skills in this area need to be consolidated and sharpened.

*Computational Complexity* Thomson/Course Technology

A very active field of research is emerging at the frontier of statistical physics, theoretical computer science/discrete mathematics, and coding/information theory. This book sets up a common language and pool of concepts, accessible to students and researchers from each of these fields.

**An Introduction to Quantum Computing** Springer Science & Business Media

This compact book presents a clear and thorough introduction to the object-oriented paradigm using the C++ language. It introduces the readers to various C++ features that support object-oriented programming (OOP) concepts. In an easy-to-comprehend format, the text teaches how to start and compile a C++ program and discusses the use of C++ in OOP. The book covers the full range of object-oriented topics, from the fundamental features through classes, inheritance, polymorphism, template, exception handling and standard template library. **KEY FEATURES** • Includes several pictorial descriptions of the concepts to facilitate better understanding. • Offers numerous class-tested programs and examples to show the practical application of theory. • Provides a summary at the end of each chapter to help students in revising all key facts. The book is designed for use as a text by undergraduate students of engineering, undergraduate and postgraduate students of computer applications, and postgraduate students of management.

*Mathematics and Computation* Oxford University Press on Demand

This elementary presentation exposes readers to both the process of rigor and the rewards inherent in taking an axiomatic approach to the study of functions of a real variable. The aim is to challenge and improve mathematical intuition rather than to verify it. The philosophy of this book is to focus attention on questions which give analysis its inherent fascination. Each chapter begins with the discussion of some motivating examples and concludes with a series of questions.

[Introduction to Computer Theory](#) Cengage Learning

An accessible and rigorous textbook for introducing undergraduates to computer science theory *What Can Be Computed?* is a uniquely accessible yet rigorous introduction to the most profound ideas at the heart of computer science.

Crafted specifically for undergraduates who are studying the subject for the first time, and requiring minimal prerequisites, the book focuses on the essential fundamentals of computer science theory and features a practical approach that uses real computer programs (Python and Java) and encourages active experimentation. It is also ideal for self-study and reference. The book covers the standard topics in the theory of computation, including Turing machines and finite automata, universal computation, nondeterminism, Turing and Karp reductions, undecidability, time-complexity classes such as P and NP, and NP-completeness, including the Cook-Levin Theorem. But the book also provides a broader view of computer science and its historical development, with discussions of Turing's original 1936 computing machines, the connections between undecidability and Gödel's incompleteness theorem, and Karp's famous set of twenty-one NP-complete problems. Throughout, the book recasts traditional computer science concepts by considering how computer programs are used to solve real problems. Standard theorems are stated and proven with full mathematical rigor, but motivation and understanding are enhanced by considering concrete implementations. The book's examples and other content allow readers to view demonstrations of—and to experiment with—a wide selection of the topics it covers. The result is an ideal text for an introduction to the theory of computation. An accessible and rigorous introduction to the essential fundamentals of computer science theory, written specifically for undergraduates taking introduction to the theory of computation Features a practical, interactive approach using real computer programs (Python in the text, with forthcoming Java alternatives online) to enhance motivation and understanding Gives equal emphasis to computability and complexity Includes special topics that demonstrate the profound nature of key ideas in the theory of computation Lecture slides and Python programs are available at [whatcanbecomputed.com](http://whatcanbecomputed.com)

**Introduction to Languages and the Theory of Computation** Cambridge University Press

For upper level courses on Automata. Combining classic theory with unique applications, this crisp narrative is supported by abundant examples and clarifies key concepts by introducing important uses of techniques in real systems. Broad-ranging coverage allows instructors to easily customise course material to fit their unique requirements.

**Introduction to the Theory of Computation** CRC Press

Quantum information and computation is a rapidly expanding and cross-disciplinary subject. This book, first published in 2006, gives a self-contained introduction to the field for physicists, mathematicians and computer scientists who want to know more about this exciting

subject. After a step-by-step introduction to the quantum bit (qubit) and its main properties, the author presents the necessary background in quantum mechanics. The core of the subject, quantum computation, is illustrated by a detailed treatment of three quantum algorithms: Deutsch, Grover and Shor. The final chapters are devoted to the physical implementation of quantum computers, including the most recent aspects, such as superconducting qubits and quantum dots, and to a short account of quantum information. Written at a level suitable for undergraduates in physical sciences, no previous knowledge of quantum mechanics is assumed, and only elementary notions of physics are required. The book includes many short exercises, with solutions available to instructors through [solutions@cambridge.org](mailto:solutions@cambridge.org).