Automata Computability And Complexity Theory And

A step-by-step development of the theory of automata, languages and computation. Intended for use as the basis of an introductory course at both junior and senior levels, the text is organized so as to allow the design of various courses based on selected material. It features basic models of computation, formal languages and their properties; computability, decidability and complexity; a discussion of modern trends in the theory of automata and formal languages; design of programming languages, including the development of a new programming language; and compiler design, including the construction of a complete compiler. Alexander Meduna uses clear definitions, easy-to-follow proofs and helpful examples to make formerly obscure concepts easy to understand. He also includes challenging exercises and programming projects to enhance the reader's comprehension, and many 'real world' illustrations and applications in practical computer science.

This textbook provides undergraduate students with an introduction to the basic theoretical models of computability, and develops some of the model's rich and varied structure. The first part of the book is devoted to finite automata and their properties. Pushdown automata provide a broader class of models and enable the analysis of context-free languages. In the remaining chapters, Turing machines are introduced and the book culminates in analyses of effective computability, decidability, and Gödel's incompleteness theorems. Students who already have some experience with elementary discrete mathematics will find this a well-paced first course, and a number of supplementary chapters introduce more advanced concepts.

The study of the connections between mathematical automata and for mal logic is as old as theoretical computer science itself. In the founding paper of the subject, published in 1936, Turing showed how to describe the behavior of a universal computing machine with a formula of first order predicate logic, and thereby concluded that there is no algorithm for deciding the validity of sentences in this logic. Research on the log ical aspects of the theory of finite-state automata, which is the subject of this book, began in the early 1960's with the work of J. Richard Biichi on monadic second-order logic. Biichi's investigations were extended in several directions. One of these, explored by McNaughton and Papert in their 1971 monograph Counter-free Automata, was the characterization of automata that admit first-order behavioral descriptions, in terms of the semigroup theoretic approach to automata that had recently been developed in the work of Krohn and Rhodes and of Schiitzenberger. In the more than twenty years that have passed since the appearance of McNaughton and Papert's book, the underlying semigroup theory has grown enor mously, permitting a considerable extension of their results. During the same period, however, fundamental investigations in the theory of finite automata by and large fell out of fashion in the theoretical com puter science community, which moved to other concerns.

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.

A Second Course in Formal Languages and Automata Theory

14th International Colloquium, Karlsruhe, Federal Republic of Germany, July 13-17, 1987. Proceedings

Theory Of Automata, Formal Languages And Computation (As Per Uptu Syllabus)

Pearson New International Edition

Automata, Languages and Programming

Theory of computation is seen as a branch of both theoretical computer science and modern mathematics (however, it also contains some concepts from pure mathematics). Theory of computation shows how one can effectively solve a problem using a computational model. A number of computational models are described in theory of computation. Algorithm is most common format of computational model. Algorithm is a logical, systematic presentation of the process of problem solution. It theoretically represents the procedure of solving a particular problem. Flowchart is another form of such model of computation. Simply, flowchart is a graphical representation of any algorithm, using various symbols. Each symbol of flowchart represents a particular action. Algorithms and flowcharts possess a strong relation among each other. Yet, theory of computation talks more deeply and descriptively about algorithms and less about flowcharts.

Intended for use in an introductory graduate course in theoretical computer science, this text contains material that should be core knowledge in the theory of computation for all graduates in computer science. It is self-contained and is best suited for a one semester course. The text starts with classical computability theory which forms the basis for complexity theory. This has the pedagogical advantage that students learn a qualitative subject before advancing to a quantitative one. Since this is a graduate course, students should have some knowledge of such topics as automata theory, formal languages, computability theory, or complexity theory.

This Book Is Aimed At Providing An Introduction To The Basic Models Of Computability To The Undergraduate Students. This Book Is Devoted To Finite Automata And Their Properties. Pushdown Automata Provides A Class Of Models And Enables The Analysis Of Context-Free Languages. Turing Machines Have Been Introduced And The Book Discusses Computability And Decidability. A Number Of Problems With Solutions Have Been Provided For Each Chapter. A Lot Of Exercises Have Been Given With Hints/Answers To Most Of These Tutorial Problems.

The theoretical underpinnings of computing form a standard part of almost every computer science curriculum. But the classic treatment of this material isolates it from the myriad ways in which the theory influences the design of modern hardware and software systems. The goal of this book is to change that. The book is organized into a core set of chapters (that cover the standard material suggested by the title), followed by a set of appendix chapters that highlight application areas including programming language design, compilers, software verification, networks, security, natural language processing, artificial intelligence, game playing, and computational biology. The core material includes discussions of finite state machines, Markov models, hidden Markov models (HMMs), regular expressions, context-free grammars, pushdown automata, Chomsky and Greibach normal forms, context-free parsing, pumping theorems for regular and context-free languages, closure theorems and decision procedures for regular and context-free languages, Turing machines, nondeterminism, decidability and undecidability, the Church-Turing thesis, reduction proofs, Post Correspondence problem, tiling problems, the undecidability of first-order logic, asymptotic dominance, time and space complexity, the Cook-Levin theorem, NP-completeness, Savitch's Theorem, time and space hierarchy theorems, randomized algorithms and heuristic search. Throughout the discussion of these topics there are pointers into the application chapters. So, for example, the chapter that describes reduction proofs of undecidability has a link to the security chapter, which shows a reduction proof of the undecidability of the safety of a simple protection framework.

An Introduction to Formal Languages and Automata

Theory and Applications by Elaine A. Rich, ISBN

Fundamentals of Theoretical Computer Science

Models of Computation

The foundation of computer science is built upon the following questions: What is an algorithm? What can be computed and what cannot be computed? What does it mean for a function to be computable? How does computational power depend upon programming constructs? Which algorithms can be considered feasible? For more than 70 years, computer scientists are searching for answers to such qu- tions. Their ingenious techniques used in answering these questions form the theory of computation. Theory of computation deals with the most fundamental ideas of computer s- ence in an abstract but easily understood form. The notions and techniques employed are widely spread across various topics and are found in almost every branch of c- puter science. It has thus become more than a necessity to revisit the foundation, learn the techniques, and apply them with con?dence. Overview and Goals This book is about this solid, beautiful, and pervasive foundation of computer s- ence. It introduces the fundamental notions, models, techniques, and results that form the basic paradigms of computing. It gives an introduction to the concepts and mathematics that computer scientists of our day use to model, to argue about, and to predict the behavior of algorithms and computation. The topics chosen here have shown remarkable persistence over the years and are very much in current use.

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.

This revised and extensively expanded edition of Computability and Complexity Theory comprises essential materials that are core knowledge in the theory of computation. The book is self-contained, with a preliminary chapter describing key mathematical concepts and notations. Subsequent chapters move from the qualitative aspects of classical computability theory to the quantitative aspects of complexity theory. Dedicated chapters on undecidability, NP-completeness, and relative computability focus on the limitations of computability and the distinctions between feasible and intractable. Substantial new content in this edition includes: a chapter on nonuniformity studying Boolean circuits, advice classes and the important result of Karp—Lipton. a chapter studying properties of the fundamental probabilistic complexity classes a study of the alternating Turing machine and uniform circuit classes. an introduction of counting classes, proving the famous results of Valiant and Vazirani and of Toda a thorough treatment of the proof that IP is identical to PSPACE With its accessibility and well-devised organization, this text/reference is an excellent resource and guide for those looking to develop a solid grounding in the theory of computing. Beginning graduates, advanced undergraduates, and professionals involved in theoretical computer science, complexity theory, and computability will find the book an essential and practical learning tool. Topics and features: Concise, focused materials cover the most fundamental concepts and results in the field of modern complexity theory, including the theory of NP-completeness, NP-hardness, the polynomial hierarchy, and complete problems for other complexity classes Contains information that otherwise exists only in research literature and presents it in a unified, simplified manner Provides key mathematical background information, including sections on logic and number theory and algebra Supported by numerous exercises and supplementary problems for reinforcement and self-study purposes

These are my lecture notes from CS381/481: Automata and Computability Theory, a one-semester senior-level course I have taught at Cornell Uni versity for many years. I took this course myself in thc fall of 1974 as a first-year Ph.D. student at Cornell from Juris Hartmanis and have been in love with the subject ever sin,:e. 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 go es deeper into thc 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 suitaLle to their level of mathematical skill. The purpose of t.hc course is twofold: to introduce computer science students to the rieh heritage of models and abstractions that have arisen over the years; and to dew!c'p the capacity to form abstractions of their own and reason in terms of them.

Theory of Computation

Computability, Complexity, and Languages

The Nature of Computation

What Can Be Computed?

Theory of Computation and Application (2nd Revised Edition)

Automata, Computability and ComplexityTheory and ApplicationsPrentice Hall

New and classical results in computational complexity, including interactive proofs, PCP, derandomization, and quantum computation. Ideal for graduate students.

A textbook for a graduate course on formal languages and automata theory, building on prior knowledge of theoretical computer models.

This classic book on formal languages, automata theory, and computational complexity has been updated to present theoretical concepts in a concise and straightforward manner with the increase of hands-on, practical applications. This new edition comes with Gradiance, an online assessment tool developed for computer science. Please note, Gradiance is no longer available with this book, as we no longer support this product.

Automata, Formal Languages and Computational Complexity

Theory and Applications

Problem Solving in Automata, Languages, and Complexity

Outlines and Highlights for Automata, Computability and Complexity

Formal Languages, Automata, and Complexity

Computational complexity is one of the most beautiful fields of modern mathematics, and it is increasingly relevant to other sciences ranging from physics to biology. But this beauty is often buried underneath layers of unnecessary formalism, and exciting recent results like interactive proofs, phase transitions, and quantum computing are usually considered too advanced for the typical student. This book bridges these gaps by explaining the deep ideas of theoretical computer science in a clear and enjoyable fashion, making them accessible to non-computer scientists and to computer scientists who finally want to appreciate their field from a new point of view. The authors start with a lucid and playful explanation of the P vs. NP problem, explaining why it is so fundamental, and so hard to resolve. They then lead the reader through the complexity of mazes and games; optimization in theory and practice; randomized algorithms, interactive proofs, and pseudorandomness; Markov chains and phase transitions; and the outer reaches of quantum computing. At every turn, they use a minimum of formalism, providing explanations that are both deep and accessible. The book is intended for graduate and undergraduate students, scientists from other areas who have long wanted to understand this subject, and experts who want to fall in love with this field all over again.

Automata and natural language theory are topics lying at the heart of computer science. Both are linked to computational complexity and together, these disciplines help define the parameters of what constitutes a computer, the structure of programs, which problems are solvable by computers, and a range of other crucial aspects of the practice of computer science. In this important volume, two respected authors/editors in the field offer accessible, practice-oriented coverage of these issues with an emphasis on refining core problem solving skills.

Never HIGHLIGHT a Book Again! Virtually all of the testable terms, concepts, persons, places, and events from the textbook are included. Cram101 Just the FACTS101 studyguides give all of the outlines, highlights, notes, and quizzes for your textbook with optional online comprehensive practice tests. Only Cram101 is Textbook Specific. Accompanys: 9780132288064 .

Formal languages and automata theory is the study of abstract machines and how these can be used for solving problems. The book has a simple and exhaustive approach to topics like automata theory, formal languages and theory of computation. These descriptions are followed by numerous relevant examples related to the topic. A brief introductory chapter on compilers explaining its relation to theory of computation is also given.

A Modern Approach

Finite Automata, Formal Logic, and Circuit Complexity

Automata and Computability

Modern Applications of Automata Theory

Models of Computation and Formal Languages

Takes students and researchers on a tour through some of the deepest ideas of maths, computer science and physics.

This book explores Probabilistic Cellular Automata (PCA) from the perspectives of statistical mechanics, probability theory, computational biology and computer science. PCA are extensions of the well-known Cellular Automata models of complex systems, characterized by random updating rules. Thanks to their probabilistic component, PCA offer flexible computing tools for complex numerical constructions, and realistic simulation tools for phenomena driven by interactions among a large number of neighboring structures. PCA are currently being used in various fields, ranging from pure probability to the social sciences and including a wealth of scientific and technological applications. This situation has produced a highly diversified pool of theoreticians, developers and practitioners whose interaction is highly desirable but can be hampered by differences in jargon and focus. This book – just as the workshop on which it is based – is an attempt to overcome these difference and foster interest among newcomers and interaction between practitioners from different fields. It is not intended as a treatise, but rather as a gentle introduction to the role and relevance of PCA technology, illustrated with a number of applications in probability, statistical mechanics, computer science, the natural sciences and dynamical systems. As such, it will be of interest to students and non-specialists looking to enter the field and to explore its challenges and open issues.

Juraj Hromkovic takes the reader on an elegant route through the theoretical fundamentals of computer science. The author shows that theoretical computer science is a fascinating discipline, full of spectacular contributions and miracles. The book also presents the development of the computer scientist's way of thinking as well as fundamental concepts such as approximation and randomization in algorithmics, and the basic ideas of cryptography and interconnection network design.

An Introduction to Formal Languages & Automata provides an excellent presentation of the material that is essential to an introductory theory of computation course. The text was designed to familiarize students with the foundations & principles of computer science & to strengthen the students' ability to carry out formal & rigorous mathematical argument. Employing a problem-solving approach, the text provides students insight into the course material by stressing intuitive motivation & illustration of ideas through straightforward explanations & solid mathematical proofs. By emphasizing learning through problem solving, students learn the material primarily through problem-type illustrative examples that show the motivation behind the concepts, as well as their connection to the theorems & definitions.

Introduction to the Theory of Computation

Introduction to Automata Theory, Formal Languages and Computation

Probabilistic Cellular Automata

Introduction to Automata, Computability, Complexity, Algorithmics, Randomization, Communication, and Cryptography

Concise Guide to Computation Theory

Models of Computation and Formal Languages presents a comprehensive and rigorous treatment of the theory of computability. The text takes a novel approach focusing on computational models and is the first book of its kind to feature companion software. Deus Ex Machina, developed by Nicolae Savoiu, comprises software simulations of the various computational models considered and incorporates numerous examples in a user-friendly format. Part I of the text introduces several universal models including Turing machines, Markov algorithms, and register machines. Complexity theory is integrated gradually, starting in Chapter 1. The vector machine model of parallel computation is covered thoroughly both in text and software. Part II develops the Chomsky hierarchy of formal languages and provides both a grammar-theoretic and an automata-theoretic characterization of each language family. Applications to programming languages round out an in-depth theoretical discussion, making this an ideal text for students approaching this subject for the first time. Ancillary sections of several chapters relate classical computability theory to the philosophy of mind, cognitive science, and theoretical linguistics. Ideal for Theory of Computability and Theory of Algorithms courses at the advanced undergraduate or beginning graduate level, Models of Computation and Formal Languages is one of the only texts that... - - Features accompanying software available on the World Wide Web at http: //home.manhattan.edu/ gregory.taylor/thcomp/ Adopts an integrated approach to complexity theory - Offers a solutions manual containing full solutions to several hundred exercises. Most of these solutions are available to students on the World Wide Web at http: //home.manhattan.edu/ gregory.taylor/thcomp - Features examples relating the theory of computation to the probable programming experience of an undergraduate computer science major

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.

This textbook is uniquely written with dual purpose. It cover cores 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 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 G�del 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

Theory, Applications and Future Perspectives

Automata, Languages and Computation

Automata, Computability and Complexity

A Practical Guide to the Theory of Computation

Theoretical Computer Science

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.

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

This volume contains the proceedings of the 14th International Colloquium on Automata Languages and Programming, organized by the European Association for Theoretical Computer Science (EATCS) and held in Karlsruhe, July 13-17, 1987. The papers report on original research in theoretical computer science and cover topics such as algorithms and data structures, automata and formal languages, computability and complexity theory, semantics of programming languages, program specification, transformation and verification, theory of data bases, logic programming, theory of logical design and layout, parallel and distributed computation, theory of concurrency, symbolic and algebraic computation, term rewriting systems, cryptography, and theory of robotics. The authors are young scientists and leading experts in these areas.

Preliminaries; Finite automata and regular languages; Pushdown automata and context-free languages; Turing machines and phrase-structure languages; Computability; Complexity; Appendices.

From a Programming Perspective

Theory of Computer Science

Computability and Complexity

Computational Complexity

Introduction to Languages and the Theory of Computation

"Intended as an upper-level undergraduate or introductory graduate text in computer science theory," this book lucidly covers the key concepts and theorems of the theory of computation. The presentation is remarkably clear; for example, the "proof idea," which offers the reader an intuitive feel for how the proof was constructed, accompanies many of the theorems and a proof. Introduction to the Theory of Computation covers the usual topics for this type of text plus it features a solid section on complexity theory--including an entire chapter on space complexity. The final chapter introduces more advanced topics, such as the discussion of complexity classes associated with probabilistic algorithms.

This introductory text covers the key areas of computer science, including recursive function theory, formal languages, and automata. Additions to the second edition include: extended exercise sets, which vary in difficulty; expanded section on recursion theory; new chapters on program verification and logic programming; updated references and examples throughout.

About the Book: This book is intended for the students who are pursuing courses in B.Tech/B.E. (CSE/IT), M.Tech/M.E. (CSE/IT), MCA and M.Sc (CS/IT). The book covers different crucial theoretical aspects such as of Automata Theory, Formal Language Theory, Computability Theory and Computational Complexity Theory and their applications. This book can be used as a text or reference book for a one-semester course in theory of computation or automata theory. It includes the detailed coverage of ? Introduction to Theory of Computation ? Essential Mathematical Concepts ? Finite State Automata ? Formal Language & Formal Grammar ? Regular Expressions & Regular Languages ? Context-Free Grammar ? Pushdown Automata ? Turing Machines ? Recursively Enumerable & Recursive Languages ? Complexity Theory Key Features: « Presentation of concepts in clear, compact and comprehensible manner « Chapter-wise supplement of theorems and formal proofs « Display of chapter-wise appendices with case studies, applications and some pre-requisites « Pictorial two-minute drill to summarize the whole concept « Inclusion of more than 200 solved with additional problems « More than 130 numbers of GATE questions with their keys for the aspirants to have the thoroughness, practice and multiplicity « Key terms, Review questions and Problems at chapter-wise termination What is New in the 2nd Edition?? « Introduction to Myhill-Nerode theorem in Chapter-3 « Updated GATE questions and keys starting from the year 2000 to the year 2018 «Practical Implementations through JFLAP Simulator About the Authors: Soumya Ranjan Jena is the Assistant Professor in the School of Computing Science and Engineering at Galgotias University, Greater Noida, U.P., India. Previously he has worked at GITA, Bhubaneswar, Odisha, K L Deemed to be University, A.P and AKS University, M.P, India. He has more than 5 years of teaching experience. He has been awarded M.Tech in IT, B.Tech in CSE and CCNA. He is the author of Design and Analysis of Algorithms book published by University Science Press, Laxmi Publications Pvt. Ltd, New Delhi. Santosh Kumar Swain, Ph.D, is an Professor in School of Computer Engineering at KIIT Deemed to be University, Bhubaneswar, Odisha. He has over 23 years of experience in teaching to graduate and post-graduate students of computer engineering, information technology and computer applications. He has published more than 40 research papers in International Journals and Conferences and one patent on health monitoring system.

This textbook presents a thorough foundation to the theory of computation. Combining intuitive descriptions and illustrations with rigorous arguments and detailed proofs for key topics, the logically structured discussion guides the reader through the core concepts of automata and languages, computability, and complexity of computation. Topics and features: presents a detailed introduction to the theory of computation, complete with concise explanations of the mathematical prerequisites; provides end-of-chapter problems with solutions, in addition to chapter-opening summaries and numerous examples and definitions throughout the text; draws upon the author's extensive teaching experience and broad research interests; discusses finite automata, context-free languages, and pushdown automata; examines the concept, universality and limitations of the Turing machine; investigates computational complexity based on Turing machines and Boolean circuits, as well as the notion of NP-completeness.

Automata and Languages

Elements of Computation Theory

Quantum Computing Since Democritus

Computability and Complexity Theory

Introduction to Automata Theory, Languages, and Computation