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Introduction to Mathematics for Software Engineering

Throughout, the premise is that mathematics is as essential to design and construction in software engineering as it is to other engineering disciplines. The exercises range from simple drills, intended to provide familiarity with concepts and notation, to advanced material.

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Mathematics is an important foundation for many science and engineering domains. Similarly, Discrete mathematics and logic are foundations for computer-based disciplines such as Computer Science , Software Engineering and Information Systems.

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~~Software Engineering Mathematics: Formal Methods~~

Software Engineering Mathematics An essential advantage of a mathematical specification is the ability to reason about the objects it contains, and thus about the system it describes. This course is an introduction to specification using mathematics. It shows how we may reason about the objects in a specification with varying degrees of formality.

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This is a blog about software, some mathematics, and the occasional philosophy. Not necessarily in that order. On Software Engineering, Mathematics Philosophy. ... I am a Professor of Software Engineering at the Faculty of Engineering, University of Porto and Research Associate at INESC TEC.

~~On Software Engineering, Mathematics and Philosophy~~

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23.3 Reverse software engineering of **. The following Matlab session records a sequence of tests of the elapsed times for various computations on a workstation manufactured in 1991. For ...

Discrete mathematics is the basic language which every student of computing should take pride in mastering and this book should prove an essential tool in this aim.

Mathematics for Electrical Engineering and Computing embraces many applications of modern mathematics, such as Boolean Algebra and Sets and Functions, and also teaches both discrete and continuous systems - particularly vital for Digital Signal Processing (DSP). In addition, as most modern engineers are required to study software, material suitable for Software Engineering - set theory, predicate and propositional calculus, language and graph theory - is fully integrated into the book. Excessive technical detail and language are avoided, recognising that the real requirement for practising engineers is the need to understand the applications of mathematics in everyday engineering contexts. Emphasis is given to an appreciation of the fundamental concepts behind the mathematics, for problem solving and undertaking critical analysis of results, whether using a calculator or a computer. The text is backed up by numerous exercises and worked examples throughout, firmly rooted in engineering practice, ensuring that all mathematical theory introduced is directly relevant to real-world engineering. The book includes introductions to advanced topics such as Fourier analysis, vector calculus and random processes, also making this a suitable introductory text for second year undergraduates of electrical, electronic and computer engineering, undertaking engineering mathematics courses. Dr Attenborough is a former Senior Lecturer in the School of Electrical, Electronic and Information Engineering at South Bank University. She is currently Technical Director of The Webbery - Internet development company, Co. Donegal, Ireland. Fundamental principles of mathematics introduced and applied in engineering practice, reinforced through over 300 examples directly relevant to real-world engineering

This book makes the mathematical basis of formal methods accessible both to the student and to the professional. It is motivated in the later chapters by examples and exercises. Throughout, the premise is that mathematics is as essential to design and construction in software engineering as it is to other engineering disciplines. The exercises range from simple drills, intended to provide familiarity with concepts and notation, to advanced material. The first four chapters of the book are devoted to foundations, with an introduction to formal systems, then the propositional and predicate calculi, concluding with a chapter on theories in general. The second part of the book builds upon the foundations by covering in detail the theory of sets, relations, functions, and sequences. The mathematical data types then presented are powerful enough to describe many aspects of software systems, and small case studies are included as examples of their use in the modelling of software: a configuration manager, a storage allocator, and a simple backing store interface. The concrete syntax of the Z notation has been adopted. The third part of the book presents two detailed case studies in the use of mathematics in software engineering. The first is the specification of the behaviour of a telephone exchange, and the second illustrates the importance of the development of a mathematical theory in gaining an understanding of a system. Both case studies stress the roles of modelling and of proof in the construction of specifications. The final part describes the algebraic approach to specification and then summarizes and compares the various formal techniques.

This book covers elementary discrete mathematics for computer science and engineering. It emphasizes mathematical definitions and proofs as well as applicable methods. Topics include formal logic notation, proof methods; induction, well-ordering; sets, relations; elementary graph theory; integer congruences; asymptotic notation and growth of functions; permutations and combinations, counting principles; discrete probability. Further selected topics may also be covered, such as recursive definition and structural induction; state machines and invariants; recurrences; generating functions.

This book provides a comprehensive introduction to various mathematical approaches to achieving high-quality software. An introduction to mathematics that is essential for sound software engineering is provided as well as a discussion of various mathematical methods that are used both in academia and industry. The mathematical approaches considered include: Z specification language Vienna Development Methods (VDM) Irish school of VDM (VDM) approach of Dijkstra and Hoare classical engineering approach of Farnas Cleanroom approach developed at IBM software reliability, and unified modelling language (UML). Additionally, technology transfer of the mathematical methods to industry is considered. The book explains the main features of these approaches and applies mathematical methods to solve practical problems. Written with both student and professional in mind, this book assists the reader in applying mathematical methods to solve practical problems that are relevant to software engineers.

Get the most out of this foundational reference and improve the productivity of your software teams. This open access book collects the wisdom of the 2017 "Dagstuhl" seminar on productivity in software engineering, a meeting of community leaders, who came together with the goal of rethinking traditional definitions and measures of productivity. The results of their work, Rethinking Productivity in Software Engineering, includes chapters covering definitions and core concepts related to productivity, guidelines for measuring productivity in specific contexts, best practices and pitfalls, and theories and open questions on productivity. You'll benefit from the many short chapters, each offering a focused discussion on one aspect of productivity in software engineering. Readers in many fields and industries will benefit from their collected work. Developers wanting to improve their personal productivity, will learn effective strategies for overcoming common issues that interfere with progress. Organizations thinking about building internal programs for measuring productivity of programmers and teams will learn best practices from industry and researchers in measuring productivity. And researchers can leverage the conceptual frameworks and rich body of literature in the book to effectively pursue new research directions. What You'll LearnReview the definitions and dimensions of software productivity See how time management is having the opposite of the intended effect Develop valuable dashboards Understand the impact of sensors on productivity Avoid software development waste Work with human-centered methods to measure productivity Look at the intersection of neuroscience and productivity Manage interruptions and context-switching Who Book Is For Industry developers and those responsible for seminar-style courses that include a segment on software developer productivity. Chapters are written for a generalist audience, without excessive use of technical terminology.

In Math for Programmers you'll explore important mathematical concepts through hands-on coding. Filled with graphics and more than 300 exercises and mini-projects, this book unlocks the door to interesting-and lucrative!-careers in some of today's hottest fields. As you tackle the basics of linear algebra, calculus, and machine learning, you'll master the key Python libraries used to turn them into real-world software applications. Summary To score a job in data science, machine learning, computer graphics, and cryptography, you need to bring strong math skills to the party. Math for Programmers teaches the math you need for these hot careers, concentrating on what you need to know as a developer. Filled with lots of helpful graphics and more than 200 exercises and mini-projects, this book unlocks the door to interesting-and lucrative!-careers in some of today's hottest programming fields. Purchase of the print book includes a free eBook in PDF, Kindle, and ePub formats from Manning Publications. About the technology Skip the mathematical jargon: This one-of-a-kind book uses Python to teach the math you need to build games, simulations, 3D graphics, and machine learning algorithms. Discover how algebra and calculus come alive when you see them in code! About the book In Math for Programmers you'll explore important mathematical concepts through hands-on coding. Filled with graphics and more than 300 exercises and mini-projects, this book unlocks the door to interesting-and lucrative!-careers in some of today's hottest fields. As you tackle the basics of linear algebra, calculus, and machine learning, you'll master the key Python libraries used to turn them into real-world software applications. What's inside Vector geometry for computer graphics Matrices and linear transformations Core concepts from calculus Simulation and optimization Image and audio processing Machine learning algorithms for regression and classification About the reader For programmers with basic skills in algebra. About the author Paul Orland is a programmer, software entrepreneur, and math enthusiast. He is co-founder of Tachyus, a start-up building predictive analytics software for the energy industry. You can find him online at www.paulorland. Table of Contents 1 Learning math with code PART 1 - VECTORS AND GRAPHICS 2 Drawing with 2D vectors 3 Ascending to the 3D world 4 Transforming vectors and graphics 5 Computing transformations with matrices 6 Generalizing to higher dimensions 7 Solving systems of linear equations PART 2 - CALCULUS AND PHYSICAL SIMULATION 8 Understanding rates of change 9 Simulating moving objects 10 Working with symbolic expressions 11 Simulating force fields 12 Optimizing a physical system 13 Analyzing sound waves with a Fourier series PART 3 - MACHINE LEARNING APPLICATIONS 14 Fitting functions to data 15 Classifying data with logistic regression 16 Training neural networks

This illuminating textbook provides a concise review of the core concepts in mathematics essential to computer scientists. Emphasis is placed on the practical computing applications enabled by seemingly abstract mathematical ideas, presented within their historical context. The text spans a broad selection of key topics, ranging from the use of finite field theory to correct code and the role of number theory in cryptography, to the value of graph theory when modelling networks and the importance of formal methods for safety critical systems. This fully updated new edition has been expanded with a more comprehensive treatment of algorithms, logic, automata theory, model checking, software reliability and dependability, algebra, sequences and series, and mathematical induction. Topics and features: includes numerous pedagogical features, such as chapter-opening key topics, chapter introductions and summaries, review questions, and a glossary; describes the historical contributions of such prominent figures as Leibniz, Babbage, Boole, and von Neumann; introduces the fundamental mathematical concepts of sets, relations and functions, along with the basics of number theory, algebra, algorithms, and matrices; explores arithmetic and geometric sequences and series, mathematical induction and recursion, graph theory, computability and decidability, and automata theory; reviews the core issues of coding theory, language theory, software engineering, and software reliability, as well as formal methods and model checking; covers key topics on logic, from ancient Greek contributions to modern applications in AI, and discusses the nature of mathematical proof and theorem proving; presents a short introduction to probability and statistics, complex numbers and quaternions, and calculus. This engaging and easy-to-understand book will appeal to students of computer science wishing for an overview of the mathematics used in computing, and to mathematicians curious about how their subject is applied in the field of computer science. The book will also capture the interest of the motivated general reader.

Computational Mathematics in Engineering and Applied Science provides numerical algorithms and associated software for solving a spectrum of problems in ordinary differential equations (ODEs), differential algebraic equations (DAEs), and partial differential equations (PDEs) that occur in science and engineering. It presents detailed examples, each

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