C Templates The Complete

The peer-reviewed papers featured in this volume were chosen from the revised notes of lectures given at the third CEFP School in 2009. They cover a number of topics such as design patterns, semantics, types, and advanced programming in various FP languages. Applied Computational Physics is a graduate-level text stressing three essential elements: advanced programming techniques, numerical analysis, and physics. The goal of the text is to provide students with essential computational skills that they will need in their careers, and to increase the confidence with which they write computer programs designed for their problem domain, physics. The physics problems give them an opportunity to reinforce their programmingskills, while the acquired programming skills augment their ability to solve physics problems. The C++ language is used throughout the text. Physics problems include Hamiltonian systems, chaoticsystems, percolation, critical phenomena, few-body and multi-body quantum systems, quantum field theory, simulation of radiation transport, and data modeling. The book, the fruit of a collaboration between a theoretical physicist and an experimental physicist, covers a broad diversity of topics from both viewpoints. Examples, program libraries, and additional documentation can be found at the companion website. Hundreds of original problems reinforce programming skills and increase theability to solve real-life physics problems at and beyond the graduate level. C++ Primer Plus, Sixth Edition New C++11 Coverage C++ Primer Plus is a carefully crafted, complete tutorial on one of the most significant and widely used programming languages today. An accessible and easy-to-use self-study guide, this book is appropriate for both serious students of programming as well as developers already proficient in other languages. The sixth edition of C++ Primer Plus has been updated and expanded to cover the latest developments in C++, including a detailed look at the new C++11 standard. Author and educator Stephen Prata has created an introduction to C++ that is instructive, clear, and insightful. Fundamental programming concepts are explained along with details of the C++ language. Many short, practical examples illustrate just one or two concepts at a time, encouraging readers to master new topics by immediately putting them to use. Review questions and programming exercises at the end of each chapter help readers zero in on the most critical information and digest the most difficult concepts. In C++ Primer Plus, you'll find depth, breadth, and a variety of teaching techniques and tools to enhance your learning: A new detailed chapter on the changes and additional capabilities introduced in the C++11 standard Complete, integrated discussion of both basic C language and additional C++ features Clear guidance about when and why to use a feature Hands-on learning with concise and simple examples that develop your understanding a concept or two at a time Hundreds of practical sample programs Review questions and programming exercises at the end of each chapter to test your understanding Coverage of generic C++ gives you the greatest possible flexibility Teaches the ISO standard, including discussions of templates, the Standard Template Library, the string class, exceptions, RTTI, and namespaces Table of Contents 1: Getting Started with C++ 2: Setting Out to C++ 3: Dealing with Data 4: Compound Types 5: Loops and Relational Expressions 6: Branching Statements and Logical Operators 7: Functions: C++'s Programming Modules 8: Adventures in Functions 9: Memory Models and Namespaces 10: Objects and Classes 11: Working with Classes 12: Classes and Dynamic Memory Allocation 13: Class Inheritance 14: Reusing Code in C++ 15: Friends, Exceptions, and More 16: The string Class and the Standard Template Library 17: Input, Output, and Files 18: The New C++11 Standard A Number Bases B C++ Reserved Words C The ASCII Character Set D Operator Precedence E Other Operators F The stringTemplate Class G The Standard Template Library Methods and Functions H Selected Readings and Internet Resources I Converting to ISO Standard C++ J Answers to Chapter Reviews

This document constitutes a detailed set of lecture slides on programming using the C++ programming language. The topics covered are quite broad, including the history of C++, the C++ language itself, the C++ standard library and various other libraries, and software tools, as well as numerous other programming-related topics. Coverage of C++ is current with the C++14 standard. Many aspects of the C++ language are covered from introductory to more advanced. This material includes: language basics (objects, types, values, operators, expressions, control-flow constructs, functions, and namespaces), classes, templates (function, class, alias, and variable templates; template specialization; and variadic templates), lambda expressions, inheritance and run-time polymorphism, exceptions (exception safety, RAII, and smart pointers), rvalue references (move semantics and perfect forwarding), concurrency (sequential consistency, atomic memory operations, data races; threads, mutexes, condition variables, promises and futures, atomics, and fences; happens-before and synchronizes-with relationships; and sequentially-consistent and other memory models). A number of best practices, tips, and idioms regarding the use of the language are also presented. Some aspects of the C++ standard library are covered, including: containers, iterators, and algorithms; the std::vector and std::basic_string classes; I/O streams; time measurement; and smart pointers. Various general programming-related topics are also presented, such as material on: good programming practices, finite-precision arithmetic, software documentation, software build tools (such as CMake and Make), and version control systems (such as Git).

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The LNCS journal Transactions on Rough Sets is devoted to the entire spectrum of rough sets related issues, starting from logical and mathematical foundations, through all aspects of rough set theory and its applications, such as data mining, knowledge discovery, and intelligent information processing, to relations between rough sets and other approaches to uncertainty, vagueness, and incompleteness, such as fuzzy sets and theory of evidence. This first volume of the Transactions on Rough Sets opens with an introductory article by Zdzislaw Pawlak, the originator of rough sets. Nine papers deal with rough set theory and eight are devoted to applications in various domains.

Templates are among the most powerful features of C++, but they are too often neglected, misunderstood, and misused. C++ Templates: The Complete Guide provides software architects and engineers with a clear understanding of why, when, and how to use templates to build and maintain cleaner, faster, and smarter software more efficiently. C++ Templates begins with an insightful tutorial on basic concepts and language features. The remainder of the book serves as a comprehensive reference, focusing first on language details, then on a wide range of coding techniques, and finally on advanced appl.

This book constitutes the refereed proceedings of the Third International Conference on Generative Programming and Component Engineering, GPCE 2004, held in Vancouver, Canada in October 2004. The 25 revised full papers presented together with abstracts of 2 invited talks were carefully reviewed and selected from 75 submissions. The papers are organized in topical sections on aspect-orientation, staged programming, types for meta-programming, meta-programming, model-driven approaches, product lines, and domain-specific languages and generation.

Develop the software and hardware you never think about. We're talking about the nitty-gritty behind the buttons on your microwave, inside your thermostat, inside the keyboard used to type this description, and even running the monitor on which you are reading it now. Such stuff is termed embedded systems, and this book shows how to design and develop embedded systems at a professional level. Because yes, many people quietly make a successful career doing just that. Building embedded systems can be both fun and intimidating. Putting together an embedded system requires skill sets from multiple engineering disciplines, from software and hardware in particular. Building Embedded

Systems is a book about helping you do things in the right way from the beginning of your first project: Programmers who know software will learn what they need to know about hardware. Engineers with hardware knowledge likewise will learn about the software side. Whatever your background is, Building Embedded Systems is the perfect book to fill in any knowledge gaps and get you started in a career programming for everyday devices. Author Changyi Gu brings more than fifteen years of experience in working his way up the ladder in the field of embedded systems. He brings knowledge of numerous approaches to embedded systems design, including the System on Programmable Chips (SOPC) approach that is currently growing to dominate the field. His knowledge and experience make Building Embedded Systems an excellent book for anyone wanting to enter the field, or even just to do some embedded programming as a side project. What You Will Learn Program embedded systems at the hardware level Learn current industry practices in firmware development Develop practical knowledge of embedded hardware options Create tight integration between software and hardware Practice a work flow leading to successful outcomes Build from transistor level to the system level Make sound choices between performance and cost Who This Book Is For Embedded-system engineers and intermediate electronics enthusiasts who are seeking tighter integration between software and hardware. Those who favor the System on a Programmable Chip (SOPC) approach will in particular benefit from this book. Students in both Electrical Engineering and Computer Science can also benefit from this book and the real-life industry practice it provides.

From object technology pioneer and ETH Zurich professor Bertrand Meyer, winner of the Jolt award and the ACM Software System Award, a revolutionary textbook that makes learning programming fun and rewarding. Meyer builds his presentation on a rich object-oriented software system supporting graphics and multimedia, which students can use to produce impressive applications from day one, then understand inside out as they learn new programming techniques. Unique to Touch of Class is a combination of a practical, hands-on approach to programming with the introduction of sound theoretical support focused on helping students learn the construction of high quality software. The use of full color brings exciting programming concepts to life. Among the useful features of the book is the use of Design by Contract, critical to software quality and providing a gentle introduction to formal methods. Will give students a major advantage by teaching professional-level techniques in a literate, relaxed and humorous way.

Templates are among the most powerful features of C++, but they are too often neglected, misunderstood, and misused. C++ Templates: The Complete Guide provides software architects and engineers with a clear understanding of why, when, and how to use templates to build and maintain cleaner, faster, and smarter software more efficiently. C++ Templates begins with an insightful tutorial on basic concepts and language features. The remainder of the book serves as a comprehensive reference, focusing first on language details, then on a wide range of coding techniques, and finally on advanced applications for templates. Examples used throughout the book illustrate abstract concepts and demonstrate best practices. Readers learn The exact behaviors of templates How to avoid the pitfalls associated with templates Idioms and techniques, from the basic to the previously undocumented How to reuse source code without threatening performance or safety How to increase the efficiency of C++ programs How to produce more flexible and maintainable software This practical guide shows programmers how to exploit the full power of the template features in C++. The companion Web site at http://www.josuttis.com/tmplbook/ contains sample code and additional updates.

This document, which consists of approximately 2500 lecture slides, offers a wealth of information on many topics relevant to programming in C++, including coverage of the C++ language itself, the C++ standard library and a variety of other libraries, numerous software tools, and an assortment of other programming-related topics. The coverage of the C++ language and standard library is current with the C++17 standard.

C++ PROGRAMMING LANGUAGE. Many aspects of the C++ language are covered from introductory to more advanced. This material includes: the preprocessor, language basics (objects, types, values, operators, expressions, control-flow constructs, functions, and namespaces), classes, templates (function, class, variable, and alias templates, variadic templates, template specialization, and SFINAE), lambda expressions, inheritance (run-time polymorphism and CRTP), exceptions (exception safety and RAII), smart pointers, memory management (new and delete operators and expressions, placement new, and allocators), rvalue references (move semantics and perfect forwarding), concurrency (memory models, and happens-before and synchronizes-with relationships), compile-time computation, and various other topics (e.g., copy elision and initialization). C++ STANDARD LIBRARY AND VARIOUS OTHER LIBRARIES. Various aspects of the C++ standard library are covered including: containers, iterators, algorithms, I/O streams, time measurement, and concurrency support (threads, mutexes, condition variables, promises and futures, atomics, and fences). A number of Boost libraries are discussed, including the Intrusive, Iterator, and Container libraries. The OpenGL library and GLSL are discussed at length, along with several related libraries, including: GLFW, GLUT, and GLM. The CGAL library is also discussed in some detail. SOFTWARE TOOLS. A variety of software tools are discussed, including: static analysis tools (e.g., Clang Tidy and Clang Static Analyzer), code sanitizers (e.g., ASan, LSan, MSan, TSan, and UBSan), debugging and testing tools (e.g., Valgrind, LLVM XRay, and Catch2), performance analysis tools (e.g., Perf, PAPI, Gprof, and Valgrind/Callgrind), build tools (e.g., CMake and Make), version control systems (e.g., Git), code coverage analysis tools (e.g., Gcov, LLVM Cov, and Lcov), online C++ compilers (e.g., Compiler Explorer and C++ Insights), and code completion tools (e.g., YouCompleteMe, and LSP clients/servers).

C++ TemplatesThe Complete Guide, Portable DocumentsAddison-Wesley Professional

All the new language and library features of C++17 (for those who know the previous versions of C++). C++17 is the next evolution in modern C++ programming, which is already now supported by the latest version of gcc, clang, and Visual C++. Although it is not as big a step as C++11, it contains a large number of small and valuable language and library features, which will change the way we program in C++. As usual, not everything is self-explanatory, combining new features gives even more power, and there are hidden traps. This book presents all the new language and library features of C++17. It covers the motivation and context of each new feature with examples and background information. The focus is on how these features impact day-to-day programming, what it means to combine them, and how to benefit from this in practice.

Computer programming.

This book analyzes the application of the legal principle of non-discrimination in the context of energy network operation. Since the early 1990s, the duty not to discriminate has applied to energy network operators, in order to achieve a liberalized European energy market in which European consumers have a free and real choice of energy supplier. The book provides guidance to those working in the context of the non-discrimination obligation, such as energy network operators, regulatory authorities, national courts, and other energy market players, as well as those studying the rules for (academic) research purposes. The book's conclusions serve as a tool for critical consideration and offer suggestions for improvements to the legal framework and its application on a European, as well as a national, level. Several questions are answered, including why energy network operators have a non-discrimination obligation in the context of energy market liberalization, how European law has tried to remove and control the discrimination problem since the early 1990s, and when different treatment of energy network users amounts to 'forbidden' discrimination. The book's conclusions are underpinned by comparisons with competition law, public

procurement law, and telecommunications law, as well as a case study on how energy network operators and regulators in several Member States currently interpret and apply the non-discrimination obligation. (Series: Energy & Law - Vol. 15)

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This book presents a large collection of exercises for learning to program in C++. A study plan for learning C++ based on a collection of video lectures and supplemental reading is also provided.

This document constitutes a detailed set of lecture slides on the C++ programming language and is current with the C++14 standard. Many aspects of the language are covered from introductory to more advanced. This material includes: language basics (objects, types, values, operators, expressions, control-flow constructs, functions, and namespaces), classes, templates (function, class, alias, and variable templates; template specialization; and variadic templates), lambda expressions, inheritance and run-time polymorphism, exceptions (exception safety, RAII, and smart pointers), rvalue references (move semantics and perfect forwarding), concurrency (sequential consistency, atomic memory operations, data races; threads, mutexes, condition variables, promises and futures, atomics, and fences; happens-before and synchronizes-with relationships; and sequentially-consistent and other memory models). A number of best practices, tips, and idioms regarding the use of the language are also presented. Some aspects of the C++ standard library are covered, including: containers, iterators, and algorithms; the std::vector and std::basic_string classes; I/O streams; and time measurement. Various general programming-related topics are also presented, such as material on: good programming practices, finite-precision arithmetic, and software documentation.

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This document, which consists of over 2000 lecture slides, offers a wealth of information on many topics relevant to programming in C++, including coverage of the C++ language itself, the C++ standard library and a variety of other libraries, numerous software tools, and an assortment of other programming-related topics. The coverage of the C++ language and standard library is current with the C++17 standard. C++ PROGRAMMING LANGUAGE. Many aspects of the C++ language are covered from introductory to more advanced. This material includes: the preprocessor, language basics (objects, types, values, operators, expressions, control-flow constructs, functions, and namespaces), classes, templates (function, class, variable, and alias templates, variadic templates, template specialization, and SFINAE), lambda expressions, inheritance (run-time polymorphism and CRTP), exceptions (exception safety and RAII), smart pointers, memory management (new and delete operators and expressions, placement new, and allocators), rvalue references (move semantics and perfect forwarding), concurrency (memory models, and happens-before and synchronizes-with relationships). C++ STANDARD LIBRARY AND VARIOUS OTHER LIBRARIES. Various aspects of the C++ standard library are covered including: containers, iterators, algorithms, I/O streams, time measurement, and concurrency support (threads, mutexes, condition variables, promises and futures, atomics, and fences). A number of Boost libraries are discussed, including the Intrusive, Iterator, and Container libraries. The OpenGL library and GLSL are discussed at length, along with several related libraries, including: GLFW, GLUT, and GLM. The CGAL library is also discussed in some detail. SOFTWARE TOOLS. A

variety of software tools are discussed, including: static analysis tools (e.g., Clang Tidy), code sanitizers (e.g., ASan, UBSan, and TSan), debugging and testing tools (e.g., Catch2), performance analysis tools (e.g., Perf, PAPI, Gprof, and Valgrind/Callgrind), build tools (e.g., CMake and Make), and version control systems (e.g., Git). OTHER TOPICS. An assortment of other programming-related topics are also covered, including: data structures, algorithms, computer arithmetic (e.g., floating-point arithmetic and interval arithmetic), cache-efficient algorithms, vectorization, good programming practices, and software documentation.

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A proven best-seller, updated for the new standard: still the most practical C++ Standard Library tutorial and most complete reference * *Thoroughly documents each library component incorporated in the brand-new C++ standard. *Clearly explains complex concepts, and presents the practical detail programmers need to use the Standard Library effectively. *Contains many examples of working code, all available for download at an accompanying website. The C++ Standard Library, 2/e, doesn't just provide comprehensive documentation of every library component associated with the newest C++ standard: it also offers clearly-written explanations of complex concepts, reviews practical programming details needed for effective use, and presents many useful examples of working code - all of them available for download. Fully updated to reflect the newest elements of the C++ Standard Library incorporated into the full ANSI/ISO C++ language standard, this book examines containers, iterators, function objects, STL algorithms, special containers, strings, numerical classes, internationalization, the IOStream library, and much more. Every component is presented in depth: Josuttis explains its purpose and design, presents crystal-clear examples, identifies traps and pitfalls, and offers exact signatures and definitions of its classes and functions. Comprehensive, detailed, readable, and practical, Josuttis' The C++ Standard Library has established itself as the definitive book on the topic: working developers will find this new edition even more useful.

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This tutorial book presents an augmented selection of material presented at the International Summer School on Generative and Transformational Techniques in Software Engineering, GTTSE 2005. The book comprises 7 tutorial lectures presented together with 8 technology presentations and 6 contributions to the participants workshop. The tutorials combine foundations, methods, examples, and tool support. Subjects covered include feature-oriented programming and the AHEAD tool suite; program transformation with reflection and aspect-oriented programming, and more.

A complete textbook and reference for engineers to learn the fundamentals of computer programming with modern C++ Introduction to Programming with C++ for Engineers is an original presentation teaching the fundamentals of computer programming and modern C++ to engineers and engineering students. Professor Cyganek, a highly regarded expert in

his field, walks users through basics of data structures and algorithms with the help of a core subset of C++ and the Standard Library, progressing to the object-oriented domain and advanced C++ features, computer arithmetic, memory management and essentials of parallel programming, showing with real world examples how to complete tasks. He also guides users through the software development process, good programming practices, not shunning from explaining low-level features and the programming tools. Being a textbook, with the summarizing tables and diagrams the book becomes a highly useful reference for C++ programmers at all levels. Introduction to Programming with C++ for Engineers teaches how to program by: Guiding users from simple techniques with modern C++ and the Standard Library, to more advanced object-oriented design methods and language features Providing meaningful examples that facilitate understanding of the programming techniques and the C++ language constructions Fostering good programming practices which create better professional programmers Minimizing text descriptions, opting instead for comprehensive figures, tables, diagrams, and other explanatory material Granting access to a complementary website that contains example code and useful links to resources that further improve the reader's coding ability Including test and exam question for the reader's review at the end of each chapter Engineering students, students of other sciences who rely on computer programming, and professionals in various fields will find this book invaluable when learning to program with C++.

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The new C++11 standard allows programmers to express ideas more clearly, simply, and directly, and to write faster, more efficient code. Bjarne Stroustrup, the designer and original implementer of C++, has reorganized, extended, and completely rewritten his definitive reference and tutorial for programmers who want to use C++ most effectively. The C++ Programming Language, Fourth Edition, delivers meticulous, richly explained, and integrated coverage of the entire language—its facilities, abstraction mechanisms, standard libraries, and key design techniques. Throughout, Stroustrup presents concise, "pure C++11" examples, which have been carefully crafted to clarify both usage and program design. To promote deeper understanding, the author provides extensive cross-references, both within the book and to the ISO

standard. New C++11 coverage includes Support for concurrency Regular expressions, resource management pointers, random numbers, and improved containers General and uniform initialization, simplified for-statements, move semantics, and Unicode support Lambdas, general constant expressions, control over class defaults, variadic templates, template aliases, and user-defined literals Compatibility issues Topics addressed in this comprehensive book include Basic facilities: type, object, scope, storage, computation fundamentals, and more Modularity, as supported by namespaces, source files, and exception handling C++ abstraction, including classes, class hierarchies, and templates in support of a synthesis of traditional programming, object-oriented programming, and generic programming Standard Library: containers, algorithms, iterators, utilities, strings, stream I/O, locales, numerics, and more The C++ basic memory model, in depth This fourth edition makes C++11 thoroughly accessible to programmers moving from C++98 or other languages, while introducing insights and techniques that even cutting-edge C++11 programmers will find indispensable. This book features an enhanced, layflat binding, which allows the book to stay open more easily when placed on a flat surface. This special binding method—noticeable by a small space inside the spine—also increases durability.

The second instance of the international summer school on Generative and Transformational Techniques in Software Engineering (GTTSE 2007) was held in Braga, Portugal, during July 2–7, 2007. This volume contains an augmented selection of the material presented at the school, including full tutorials, short tutorials, and contributions to the participants workshop. The GTTSE summer school series brings together PhD students, lecturers, technology presenters, as well as other researchers and practitioners who are interested in the generation and the transformation of programs, data, models, metamodels, documentation, and entire software systems. This concerns many areas of software engineering: software reverse and re-engineering, model-driven engineering, automated software engineering, generic language technology, to name a few. These areas di?er with regard to the speci?c sorts of metamodels (or grammars, schemas, formats etc.) that underlie the involved artifacts, and with regard to the speci?c techniques that are employed for the generation and the transformation of the artifacts. The ?rst instance of the school was held in 2005 and its proceedings appeared as volume 4143 in the LNCS series.

"This book presents current research on all aspects of domain-specific language for scholars and practitioners in the software engineering fields, providing new results and answers to open problems in DSL research"--

A code-intensive guide to designing and building applications with the latest release of C++ covers changes to core language features and syntax, the latest standard library features, and best practices for programming style, testing, and debugging.

This document, which consists of approximately 2900 lecture slides, offers a wealth of information on many topics relevant to programming in

C++, including coverage of the C++ language itself, the C++ standard library and a variety of other libraries, numerous software tools, and an assortment of other programming-related topics. The coverage of the C++ language and standard library is current with the C++20 standard. C++ PROGRAMMING LANGUAGE. Many aspects of the C++ language are covered from introductory to more advanced. This material includes: the preprocessor, language basics (objects, types, values, operators, expressions, control-flow constructs, functions, namespaces, and comparison), classes, templates (function, class, variable, and alias templates, variadic templates, template specialization, and SFINAE), concepts, lambda expressions, inheritance (run-time polymorphism and CRTP), exceptions (exception safety and RAII), smart pointers, memory management (new and delete operators and expressions, placement new, and allocators), rvalue references (move semantics and perfect forwarding), coroutines, concurrency (memory models, and happens-before and synchronizes-with relationships), modules, compile-time computation, and various other topics (e.g., copy elision and initialization). C++ STANDARD LIBRARY AND VARIOUS OTHER LIBRARIES. Various aspects of the C++ standard library are covered including: containers, iterators, algorithms, ranges, I/O streams, time measurement, and concurrency support (threads, mutexes, condition variables, promises and futures, atomics, and fences). A number of Boost libraries are discussed, including the Intrusive, Iterator, and Container libraries. The OpenGL library and GLSL are discussed at length, along with several related libraries, including: GLFW, GLUT, and GLM. The CGAL library is also discussed in some detail. SOFTWARE TOOLS. A variety of software tools are discussed, including: static analysis tools (e.g., Clang Tidy and Clang Static Analyzer), code sanitizers (e.g., ASan, LSan, MSan, TSan, and UBSan), debugging and testing tools (e.g., Valgrind, LLVM XRay, and Catch2), performance analysis tools (e.g., Perf, PAPI, Gprof, and Valgrind/Callgrind), build tools (e.g., CMake and Make), version control systems (e.g., Git), code coverage analysis tools (e.g., Gcov, LLVM Cov, and Lcov), online C++ compilers (e.g., Compiler Explorer and C++ Insights), and code completion tools (e.g., YouCompleteMe, and LSP clients/servers). OTHER TOPICS. An assortment of other programming-related topics are also covered, including: data structures, algorithms, computer arithmetic (e.g., floating-point arithmetic and interval arithmetic), cache-efficient algorithms, vectorization, good programming practices, software documentation, software testing (e.g., static and dynamic testing, and structural coverage analysis), and compilers and linkers (e.g., Itanium C++ ABI).

A fast-paced, thorough introduction to modern C++ written for experienced programmers. After reading C++ Crash Course, you'll be proficient in the core language concepts, the C++ Standard Library, and the Boost Libraries. C++ is one of the most widely used languages for real-world software. In the hands of a knowledgeable programmer, C++ can produce small, efficient, and readable code that any programmer would be proud of. Designed for intermediate to advanced programmers, C++ Crash Course cuts through the weeds to get you straight to the core of C++17, the most modern revision of the ISO standard. Part 1 covers the core of the C++ language, where you'll learn about everything from types and functions, to the object life cycle and expressions. Part 2 introduces you to the C++ Standard Library and Boost Libraries, where you'll learn about all of the high-quality, fully-featured facilities available to you. You'll cover special utility classes, data structures, and algorithms, and learn how to manipulate file systems and build high-performance programs that communicate over networks. You'll learn all the major features of modern C++, including: • Fundamental types, reference types, and user-defined types • The object lifecycle including storage duration, memory management, exceptions, call stacks, and the RAII paradigm • Compile-time polymorphism with templates and run-time polymorphism with virtual classes • Advanced expressions, statements, and functions • Smart pointers, data structures, dates and times, numerics, and probability/statistics facilities • Containers, iterators, strings, and algorithms • Streams and files, concurrency, networking, and application development With well over 500 code samples and nearly 100 exercises, C++ Crash Course is sure

to help you build a strong C++ foundation.

Advanced Metaprogramming in Classic C++ aims to be both an introduction and a reference to C++ template metaprogramming (TMP); TMP is presented in the book as a set of techniques that will bring a new style in C++ and make code exceptionally clear and efficient. The book deals with language aspects, design patterns, examples and applications (seen as case studies). Special emphasis is put on small reusable techniques that will improve the quality of daily work. What makes the book exceptional is the level of understanding of the concepts involved imparted by the author. This is not just a rote overview of metaprogramming. You will truly understand difficult topics like static assertions, how to write metafunctions, overload resolution, lambda expressions, and many others. More than that, you will work through them with practical examples guided by the author's frank explanations. This book requires you to think and to learn and to understand the language so that you can program at a higher level.

This book constitutes the refereed proceedings of the Second International Conference on Generic Programming and Component Engineering, GPCE 2003, held in Erfurt, Germany in September 2003. The 21 revised full papers presented were carefully reviewed and selected from 62 submissions. The papers are organized in topical sections on domain-specific languages, staged programming, modeling to code, aspect-orientation, meta-programming and language extension, automating design-to-code transitions, principled domain-specific approaches, and generation and translation.

With this book, Christopher Kormanyos delivers a highly practical guide to programming real-time embedded microcontroller systems in C++. It is divided into three parts plus several appendices. Part I provides a foundation for real-time C++ by covering language technologies, including object-oriented methods, template programming and optimization. Next, part II presents detailed descriptions of a variety of C++ components that are widely used in microcontroller programming. It details some of C++'s most powerful language elements, such as class types, templates and the STL, to develop components for microcontroller register access, low-level drivers, custom memory management, embedded containers, multitasking, etc. Finally, part III describes mathematical methods and generic utilities that can be employed to solve recurring problems in real-time C++. The appendices include a brief C++ language tutorial, information on the real-time C++ development environment and instructions for building GNU GCC cross-compilers and a microcontroller circuit. For this fourth edition, the most recent specification of C++20 is used throughout the text. Several sections on new C++20 functionality have been added, and various others reworked to reflect changes in the standard. Also several new example projects ranging from introductory to advanced level are included and existing ones extended, and various reader suggestions have been incorporated. Efficiency is always in focus and numerous examples are backed up with runtime measurements and size analyses that quantify the true costs of the code down to the very last byte and microsecond. The target audience of this book mainly consists of students and professionals interested in real-time C++. Readers should be familiar with C or another programming language and will benefit most if they have had some previous experience with microcontroller electronics and the performance and size issues prevalent in embedded systems programming.

Computer programming means that you make those machines operate so that they can perform various useful activities for you and others. The skills of computer programming are very important in our present world, and these skills are likely to become even more important in the future. On the pages of this book, the reader is introduced in a natural way to the world of computer programming. The reader does not require any previous knowledge of the subject. The basic operating principles of computers are taught before the actual studies of computer programming begin. All the examples of computer programs are written so that the reader encounters a lot of natural-language expressions

instead of the traditional abbreviations of the computer world. This approach aims to make learning easier. The pages of the book are designed to maximize readability and understandability. Examples of computer programs are presented in easy-to-read graphical descriptions. Because the pages of the book are large, example programs can be presented in more reader-friendly way than in traditional programming books. In addition, pages are written so that the reader does not need to turn them unnecessarily. This book uses a programming language called C++ (pronounced "see plus plus") to teach computer programming. C++ is suitable for beginners in the field of computer programming because with C++ it is possible to make simple programs, and build a solid understanding of the basics of computing and programming. Plenty of programming exercises are included in the book. The reader can work with the exercises by using free programming tools on a personal computer. The book explains how to download the free programming tools from the Internet. This book is a new kind of book to learn computer programming. Making things clear and eliminating risks for misunderstanding have been primary concerns in the design of the book. Because in some ways the book is less mathematical than other programming books, some experienced computer programmers may hesitate to use it. However, for a beginner in the field of computer programming, this book offers a possibility to make learning easier. Also more experienced people can benefit from the book if they are prepared to discard the traditional abbreviations in computer programs, and follow the programming style that is advocated in the book.
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