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Essential concepts of programming language design and implementation are explained and illustrated in the context of the object-oriented programming language (OOPL) paradigm. Written with the upper-level undergraduate student in mind, the text begins with an introductory chapter that summarizes the essential features of an OOPL, then widens the discussion to categorize the other major paradigms, introduce the important issues, and define the essential terms. After a brief second chapter on event-driven programming (EDP), subsequent chapters are built around case studies in each of the languages Smalltalk, C++, Java, C#, and Python. Included in each case study is a discussion of the accompanying libraries, including the essential container classes. For each language, one important event-driven library is singled out and studied. Sufficient information is given so that students can complete an event-driven project in any of the given languages. After completing the course the student should have a solid set of skills in each language the instructor chooses to cover, a comprehensive overview of how these languages relate to each other, and an appreciation of the major issues in OOPL design. Key Features: •Provides essential coverage of Smalltalk origins, syntax, and semantics, a valuable asset for students wanting to understand the hybrid Objective C language •Provides detailed case studies of Smalltalk, Java, C++, C#, and Python and features a side-by-side development of the Java and C++ languages--highlighting their similarities and differences •Sets the discussion in a historical framework, tracing the roots of the OOPLs back to Simula 67. •Provides broad--based coverage of all languages, imparting essential skills as well as an appreciation for each language’s design philosophy •Includes chapter summary, review questions, chapter exercises, an appendix with event-driven projects, and instructor resources
For courses in computer programming. Evaluating the Fundamentals of Comput-

er Programming Languages Concepts of Computer Programming Languages introduces students to the fundamental concepts of computer programming languages and provides them with the tools necessary to evaluate contemporary and future languages. An in-depth discussion of programming language structures, such as syntax and lexical and syntactic analysis, also prepares students to study compiler design. The 11th Edition maintains an up-to-date discussion on the topic with the removal of outdated languages such as Ada and Fortran. The addition of relevant new topics and examples such as reflection and exception handling in Python and Ruby add to the currency of the text. Through a critical analysis of design issues of various program languages, Concepts of Computer Programming Languages teaches students the essential differences between computing with specific languages. With eBooks you can: search for key concepts, words and phrases make highlights and notes as you study share your notes with friends eBooks are downloaded to your computer and accessible either offline through the Bookshelf (available as a free download), available online and also via the iPad and Android apps. Upon purchase, you'll gain instant access to this eBook. Time limit The eBooks products do not have an expiry date. You will continue to access your digital ebook products whilst you have your Bookshelf installed.

Programming Languages: Concepts and Implementation teaches language concepts from two complementary perspectives: implementation and paradigms. It covers the implementation of concepts through the incremental construction of a progressive series of interpreters in Python, and Racket Scheme, for purposes of its combined simplicity and power, and assessing the differences in the resulting languages.

The earth, viewed through the window of an airplane, shows a regularity and reptition of features, for example, hills, valleys, rivers, lakes, and forests. Nevertheless, there is great local variation; Vermont does not look like Utah. Similarly, if we rise above the details of a few programming languages, we can discern features that are common to many languages. This is the programming language landscape; the main features include variables, types, control structures, and input/output. Again, there is local variation; Pascal does not look like Basic. This work is a broad and comprehensive discussion of the principal features of the major programming languages. A Study of Concepts The text surveys the landscape of programming languages and its features. Each chapter concentrates on a single language concept. A simple model of the feature, expressed as a mini-language, is presented. This allows us to study an issue in depth and relative isolation. Each chapter concludes with a discussion of the way in which the concept is incorporated into some well-known languages. This permits a reasonably complete coverage of language issues.

This book unifies a broad range of programming language concepts under the framework of type systems and structural operational semantics.

The book, suitable for a second course in computer programming at the graduate level, is for undergraduates as well as graduates interested in the design of programming languages and in the implementation of language processors as well as for those who are using computers and are faced with the need for developing data structures appropriate to

their problems. Areas covered include Markov Algorithms and primitive elements of programming, the ALGOL language, a general view of data structures, and extendability of languages through definitions. (Author).

To non-specialists in the field, the phrase "a programming language" is usually held to mean "one of those things like Autocode, Fortran, Algol or Cobol, which are supposed to make programming language easier."

In programming courses, using the different syntax of multiple languages, such as C++, Java, PHP, and Python, for the same abstraction often confuses students new to computer science. Introduction to Programming Languages separates programming language concepts from the restraints of multiple language syntax by discussing the concepts at an abstract level. Designed for a one-semester undergraduate course, this classroom-tested book teaches the principles of programming language design and implementation. It presents: Common features of programming languages at an abstract level rather than a comparative level The implementation model and behavior of programming paradigms at abstract levels so that students understand the power and limitations of programming paradigms Language constructs at a paradigm level A holistic view of programming language design and behavior To make the book self-contained, the author introduces the necessary concepts of data structures and discrete structures from the perspective of programming language theory. The text covers classical topics, such as syntax and semantics, imperative programming, program structures, information exchange between subprograms, object-oriented programming, logic programming, and functional programming. It also explores newer topics, including dependency analysis, communicating sequential processes, concurrent programming constructs, web and multimedia programming, event-based programming, agent-based programming, synchronous languages, high-productivity programming on massive parallel computers, models for mobile computing, and much more. Along with problems and further reading in each chapter, the book includes in-depth examples and case studies using various languages that help students understand syntax in practical contexts.

For one-semester, senior/graduate-level courses in Programming Languages. Rigorous, thorough, and foundational, this text reveals the character of programming languages as a field of study and explores some of the interesting, important, and conceptually more challenging topics that are often ignored by other texts on the subject.

The Formal Semantics of Programming Languages provides the basic mathematical techniques necessary for those who are beginning a study of the semantics and logics of programming languages. These techniques will allow students to invent, formalize, and justify rules with which to reason about a variety of programming languages. Although the treatment is elementary, several of the topics covered are drawn from recent research, including the vital area of concurency. The book contains many exercises ranging from simple to miniprojects.Starting with basic set theory, structural operational semantics is introduced as a way to define the meaning of programming languages along with associated proof techniques. Denotational and axiomatic semantics are illustrated on a simple language of while-programs, and fall proofs

are given of the equivalence of the operational and denotational semantics and soundness and relative completeness of the axiomatic semantics. A proof of Godel's incompleteness theorem, which emphasizes the impossibility of achieving a fully complete axiomatic semantics, is included. It is supported by an appendix providing an introduction to the theory of computability based on while-programs. Following a presentation of domain theory, the semantics and methods of proof for several functional languages are treated. The simplest language is that of recursion equations with both call-by-value and call-by-name evaluation. This work is extended to lan guages with higher and recursive types, including a treatment of the eager and lazy lambda--calculi. Throughout, the relationship between denotational and operational semantics is stressed, and the proofs of the correspondence between the operation and denotational semantics are provided. The treatment of recursive types - one of the more advanced parts of the book - relies on the use of information systems to represent domains. The book concludes with a chapter on parallel programming languages, accompanied by a discussion of methods for specifying and verifying nondeterministic and parallel programs.

"Programming languages embody the pragmatics of designing software systems, and also the mathematical concepts which underlie them. Anyone who wants to know how, for example, object-oriented programming rests upon a firm foundation in logic should read this book. It guides one surefootedly through the rich variety of basic programming concepts developed over the past forty years." -- Robin Milner, Professor of Computer Science, The Computer Laboratory, Cambridge University "Programming languages need not be designed in an intellectual vacuum; John Mitchell's book provides an extensive analysis of the fundamental notions underlying programming constructs. A basic grasp of this material is essential for the understanding, comparative analysis, and design of programming languages." -- Luca Cardelli, Digital Equipment Corporation Written for advanced undergraduate and beginning graduate students, "Foundations for Programming Languages" uses a series of typed lambda calculi to study the axiomatic, operational, and denotational semantics of sequential programming languages. Later chapters are devoted to progressively more sophisticated type systems.

"Foundations of Programming Languages" presents topics relating to the design and implementation of programming languages as fundamental skills that all computer scientists should possess. Rather than provide a feature-by-feature examination of programming languages, the author discusses programming languages organized by concepts. The first five chapters provide students with a successful foundation for the study of programming languages. This includes topics such as the data structures, expression notations, and abstraction in chapters 2 and 3. Later, meta-languages are introduced for the formal specification of the syntax and semantics of computer programming languages. This material is presented in a manner that allows one to customize the coverage based on course need. Seyed Roosta also teaches paradigm-specific topics with special care, dedicating two full chapters to each paradigm. The first focuses on the specifications of paradigm, including an emphasis on abstraction principles to help students understand the motivation behind certain de-

sign issues. The second chapter discusses the implementation issues related to the paradigm, including the use of popular programming languages to help students comprehend the relationship to the design issues discusses earlier. Paradigms discussed include the imperative, object-oriented, logic, functional, and parallel. The book concludes with new paradigms of interest today, including Data Flow, Database, Network, Internet, and Windows programming.

Explains the concepts underlying programming languages, and demonstrates how these concepts are synthesized in the major paradigms: imperative, OO, concurrent, functional, logic and with recent scripting languages. It gives greatest prominence to the OO paradigm. Includes numerous examples using C, Java and C++ as exmplar languages Additional case-study languages: Python, Haskell, Prolog and Ada Extensive end-of-chapter exercises with sample solutions on the companion Web site Deepens study by examining the motivation of programming languages not just their features

This clearly written textbook introduces the reader to the three styles of programming, examining object-oriented/imperative, functional, and logic programming. The focus of the text moves from highly prescriptive languages to very descriptive languages, demonstrating the many and varied ways in which we can think about programming. Designed for interactive learning both inside and outside of the classroom, each programming paradigm is highlighted through the implementation of a non-trivial programming language, demonstrating when each language may be appropriate for a given problem. Features: includes review questions and solved practice exercises, with supplementary code and support files available from an associated website; provides the foundations for understanding how the syntax of a language is formally defined by a grammar; examines assembly language programming using CoCo; introduces C++, Standard ML, and Prolog; describes the development of a type inference system for the language Small.

Programming Language Structures deals with the structures of programming languages and introduces the reader to five important programming languages: Algol, Fortran, Lisp, Snobol, and Pascal. The fundamental similarities and differences among these languages are discussed. A unifying framework is constructed that can be used to study the structure of other languages, such as Cobol, PL/I, and APL. Several of the tools and methodologies needed to construct large programs are also considered. Comprised of 10 chapters, this book begins with a summary of the relevant concepts and principles about algorithms, flowcharts, and computation that a student is expected to know from the first course. The discussion then turns to the semantics of procedure and function call as well as argument-parameter matching with various kinds of parameters; recursion and its relation to tree traversal; syntax formalism for context-free languages; and ALGOL 60 and block structuring. Case study programs are presented to reinforce the reader's understanding of ALGOL 60 and Fortran semantics. The remaining chapters deal with Lisp, Snobol, and Pascal. This monograph is intended for working programmers and students in computer science who have an interest in the subject of programming.

This clearly written textbook provides an accessible introduction to the three programming paradigms of object-orient-

ed/imperative, functional, and logic programming. Highly interactive in style, the text encourages learning through practice, offering test exercises for each topic covered. Review questions and programming projects are also presented, to help reinforce the concepts outside of the classroom. This updated and revised new edition features new material on the Java implementation of the JCoCo virtual machine. Topics and features: includes review questions and solved practice exercises, with supplementary code and support files available from an associated website; presents an historical perspective on the models of computation used in implementing the programming languages used today; provides the foundations for understanding how the syntax of a language is formally defined by a grammar; illustrates how programs execute at the level of assembly language, through the implementation of a stack--based Python virtual machine called JCoCo and a Python disassembler; introduces object-oriented languages through examples in Java, functional programming with Standard ML, and programming using the logic language Prolog; describes a case study involving the development of a compiler for the high level functional language Small, a robust subset of Standard ML. Undergraduate students of computer science will find this engaging textbook to be an invaluable guide to the skills and tools needed to become a better programmer. While the text assumes some background in an imperative language, and prior coverage of the basics of data structures, the hands-on approach and easy to follow writing style will enable the reader to quickly grasp the essentials of programming languages, frameworks, and architectures.

The Go Programming Language is the authoritative resource for any programmer who wants to learn Go. It shows how to write clear and idiomatic Go to solve real-world problems. The book does not assume prior knowledge of Go nor experience with any specific language, so you'll find it accessible whether you're most comfortable with JavaScript, Ruby, Python, Java, or C++. The first chapter is a tutorial on the basic concepts of Go, introduced through programs for file I/O and text processing, simple graphics, and web clients and servers. Early chapters cover the structural elements of Go programs: syntax, control flow, data types, and the organization of a program into packages, files, and functions. The examples illustrate many packages from the standard library and show how to create new ones of your own. Later chapters explain the package mechanism in more detail, and how to build, test, and maintain projects using the go tool. The chapters on methods and interfaces introduce Go's unconventional approach to object-oriented programming, in which methods can be declared on any type and interfaces are implicitly satisfied. They explain the key principles of encapsulation, composition, and substitutability using realistic examples. Two chapters on concurrency present in--depth approaches to this increasingly important topic. The first, which covers the basic mechanisms of goroutines and channels, illustrates the style known as communicating sequential processes for which Go is renowned. The second covers more traditional aspects of concurrency with shared variables. These chapters provide a solid foundation for programmers encountering concurrency for the first time. The final two chapters explore lower-level features of Go. One covers the art of metaprogramming using reflection. The other shows how to use the un-

safe package to step outside the type system for special situations, and how to use the cgo tool to create Go bindings for C libraries. The book features hundreds of interesting and practical examples of well-written Go code that cover the whole language, its most important packages, and a wide range of applications. Each chapter has exercises to test your understanding and explore extensions and alternatives. Source code is freely available for download from http://gopl.io/ and may be conveniently fetched, built, and installed using the go get command.

History of Programming Languages presents information pertinent to the technical aspects of the language design and creation. This book provides an understanding of the processes of language design as related to the environment in which languages are developed and the knowledge base available to the originators. Organized into 14 sections encompassing 77 chapters, this book begins with an overview of the programming techniques to use to help the system produce efficient programs. This text then discusses how to use parentheses to help the system identify identical subexpressions within an expression and thereby eliminate their duplicate calculation. Other chapters consider FORTRAN programming techniques needed to produce optimum object programs. This book discusses as well the developments leading to ALGOL 60. The final chapter presents the biography of Adin D. Falkoff. This book is a valuable resource for graduate students, practitioners, historians, statisticians, mathematicians, programmers, as well as computer scientists and specialists.

As execution speeds reach the physical limits of single cpu computers, the only hope of achieving greater computing power is with parallel systems. Researchers have proposed countless new programming languages, but their differences, similarities, strengths, weaknesses and problem domains are subtle and often not well understood. Informed comparison of parallel languages is difficult. This volume compares eight parallel programming languages based on solutions to four problems. Each chapter includes a description of the language's philosophy, semantics and syntax, and a solution to each problem. By considering solutions rather than language features or theoretical properties, the gap is bridged between the language specialists and users. Both professionals and students in the fields of computer and computational science will find the discussions helpful and understandable.

Programming Language Explorations is a tour of several modern programming languages in use today. The book teaches fundamental language concepts using a language-by-language approach. As each language is presented, the authors introduce new concepts as they appear, and revisit familiar ones, comparing their implementation with those from languages seen in prior chapters. The goal is to present and explain common theoretical concepts of language design and usage, illustrated in the context of practical language overviews. Twelve languages have been carefully chosen to illustrate a wide range of programming styles and paradigms. The book introduces each language with a common trio of example programs, and continues with a brief tour of its basic elements, type system, functional forms, scoping rules, concurrency patterns, and sometimes, metaprogramming facilities. Each language chapter ends with a summary, pointers to open source projects, references to materials for further study, and

a collection of exercises, designed as further explorations. Following the twelve featured language chapters, the authors provide a brief tour of over two dozen additional languages, and a summary chapter bringing together many of the questions explored throughout the text. Targeted to both professionals and advanced college undergraduates looking to expand the range of languages and programming patterns they can apply in their work and studies, the book pays attention to modern programming practice, covers cutting-edge languages and patterns, and provides many runnable examples, all of which can be found in an online GitHub repository. The exploration style places this book between a tutorial and a reference, with a focus on the concepts and practices underlying programming language design and usage. Instructors looking for material to supplement a programming languages or software engineering course may find the approach unconventional, but hopefully, a lot more fun.

This excellent addition to the UTiCS series of undergraduate textbooks provides a detailed and up to date description of the main principles behind the design and implementation of modern programming languages. Rather than focusing on a specific language, the book identifies the most important principles shared by large classes of languages. To complete this general approach, detailed descriptions of the main programming paradigms, namely imperative, object-oriented, functional and logic are given, analysed in depth and compared. This provides the basis for a critical understanding of most of the programming languages. An historical viewpoint is also included, discussing the evolution of programming languages, and to provide a context for most of the constructs in use today. The book concludes with two chapters which introduce basic notions of syntax, semantics and computability, to provide a completely rounded picture of what constitutes a programming language. /div

For courses in computerprogramming. Evaluates the fundamentals ofcontemporary computer programming languages Concepts of Computer ProgrammingLanguages introduces students to the fundamental concepts of computerprogramming languages and provides them with the tools necessary to evaluatecontemporary and future languages. Through a critical analysis of designissues, the text teaches students the essential differences between computingwith specific languages, while the in-depth discussion of programming languagestructures also prepares them to study compiler design. The 12thEdition includes new material on contemporary languages like Swift andPython, replacing discussions of outdated languages.

A comprehensive introduction to type systems and programming languages. A type system is a syntactic method for automatically checking the absence of certain erroneous behaviors by classifying program phrases according to the kinds of values they compute. The study of type systems—and of programming languages from a type-theoretic perspective—has important applications in software engineering, language design, high--performance compilers, and security. This text provides a comprehensive introduction both to type systems in computer science and to the basic theory of programming languages. The approach is pragmatic and operational; each new concept is motivated by programming examples and the more theoretical sections are driven by the needs of imple-

mentations. Each chapter is accompanied by numerous exercises and solutions, as well as a running implementation, available via the Web. Dependencies between chapters are explicitly identified, allowing readers to choose a variety of paths through the material. The core topics include the untyped lambda--calculus, simple type systems, type reconstruction, universal and existential polymorphism, subtyping, bounded quantification, recursive types, kinds, and type operators. Extended case studies develop a variety of approaches to modeling the features of object-oriented languages.

Semantics of Programming Languages exposes the basic motivations and philosophy underlying the applications of semantic techniques in computer science. It introduces the mathematical theory of programming languages with an emphasis on higher-order functions and type systems. Designed as a text for upper-level and graduate-level students, the mathematically sophisticated approach will also prove useful to professionals who want an easily referenced description of fundamental results and calculi. Basic connections between computational behavior, denotational semantics, and the equational logic of functional programs are thoroughly and rigorously developed. Topics covered include models of types, operational semantics, category theory, domain theory, fixed point (denotational). semantics, full abstraction and other semantic correspondence criteria, types and evaluation, type checking and inference, parametric polymorphism, and subtyping. All topics are treated clearly and in depth, with complete proofs for the major results and numerous exercises.

“This book is a systematic exposition of the fundamental concepts and general principles underlying programming languages in current use.” -- Preface.

A new edition of a textbook that provides students with a deep, working understanding of the essential concepts of programming languages, completely revised, with significant new material. This book provides students with a deep, working understanding of the essential concepts of programming languages. Most of these essentials relate to the semantics, or meaning, of program elements, and the text uses interpreters (short programs that directly analyze an abstract representation of the program text) to express the semantics of many essential language elements in a way that is both clear and executable. The approach is both analytical and hands-on. The book provides views of programming languages using widely varying levels of abstraction, maintaining a clear connection between the high-level and low-level views. Exercises are a vital part of the text and are scattered throughout; the text explains the key concepts, and the exercises explore alternative designs and other issues. The complete Scheme code for all the interpreters and analyzers in the book can be found online through The MIT Press web site. For this new edition, each chapter has been revised and many new exercises have been added. Significant additions have been made to the text, including completely new chapters on modules and continuation-passing style. Essentials of Programming Languages can be used for both graduate and undergraduate courses, and for continuing education courses for programmers.

Programming Languages: An Active Learning Approach introduces students to three programming paradigms: object-oriented/imperative languages using

C++ and Ruby, functional languages using Standard ML, and logic programming using Prolog. This interactive textbook is intended to be used in and outside of class. Each chapter follows a pattern of presenting a topic followed by a practice exercise or exercises that encourage students to try what they have just read. This textbook is best-suited for students with a 2-3 course introduction to imperative programming. Key Features: (1) Accessible structure guides the student through various programming languages. (2) Seamlessly integrated practice exercises. (3) Classroom-tested. (4) Online support materials. Advance praise: “The Programming Languages book market is overflowing with books, but none like this. In many ways, it is precisely the book I have been searching for to use in my own programming languages course. One of the main challenges I perpetually face is how to teach students to program in functional and logical languages, but also how to teach them about compilers. This book melds the two approaches very well.” -- David Musicant, Carleton College
" .. .1 always worked with programming languages because it seemed to me that until you could understand those, you really couldn't understand computers. Understanding them doesn't really mean only being able to use them. A lot of people can use them without understanding them." Christopher Strachey The development of programming languages is one of the finest intellectual achievements of the new discipline called Computer Science. And yet, there is no other subject that I know of, that has such emotionalism and mystique associated with it. Thus my attempt to write about this highly charged subject is taken with a good deal of caution. Nevertheless, in my role as Professor I have felt the need for a modern treatment of this subject. Traditional books on programming languages are like abbreviated language manuals, but this book takes a fundamentally different point of view. I believe that the best possible way to study and understand today's programming languages is by focusing on a few essential concepts. These concepts form the outline for this book and include such topics as variables, expressions, statements, typing, scope, procedures, data types, exception handling and concurrency. By understanding what these concepts are and how they are realized in different programming languages, one arrives at a level of comprehension far greater than one gets by writing some programs in a vi vB Preface few languages. Moreover, knowledge of these concepts provides a framework for understanding future language designs.

The design and implementation of programming languages, from Fortran and Cobol to Caml and Java, has been one of the key developments in the management of ever more complex computerized systems. Introduction to the Theory of Programming Languages gives the reader the means to discover the tools to think, design, and implement these languages. It proposes a unified vision of the different formalisms that permit definition of a programming language: small steps operational semantics, big steps operational semantics, and denotational semantics, emphasising that all seek to define a relation between three objects: a program, an input value, and an output value. These formalisms are illustrated by presenting the semantics of some typical features of programming languages: functions, recursivity, assignments, records, objects, ... showing that the study of programming languages does not con-

sist of studying languages one after another, but is organized around the features that are present in these various languages. The study of these features leads to the development of evaluators, interpreters and compilers, and also type inference algorithms, for small languages.

A++ has been developed in 2002 in the context of 'Programmierung pur' [Undiluted Programming] (ISBN 3-87820-108-7) with the purpose to serve as a learning instrument rather than as a programming language used to solve practical problems. A++ is supposed to be an efficient tool to become familiar with the core of programming and with programming patterns that can be applied in other languages needed to face the real world. This book does not only introduce A++ as a language, but also covers its implementation in Perl and C including an introduction to these languages using A++ itself. The book also contains an introduction to the Lambda-Calculus of Alonzo Church, which represents the theoretical foundation of A++.

A thorough and accessible introduction to a range of key ideas in type systems for programming language. The study of type systems for programming languages now touches many areas of computer science, from language design and implementation to software engineering, network security, databases, and analysis of concurrent and distributed systems. This book offers accessible introductions to key ideas in the field, with contributions by experts on each topic. The topics covered include precise type analyses, which extend simple type systems to give them a better grip on the run time behavior of systems; type systems for low-level languages; applications of types to reasoning about computer programs; type theory as a framework for the design of sophisticated module systems; and advanced techniques in ML-style type inference. Advanced Topics in Types and Programming Languages builds on Benjamin Pierce's Types and Programming Languages (MIT Press, 2002); most of the chapters should be accessible to readers familiar with basic notations and techniques of operational semantics and type systems—the material covered in the first half of the earlier book. Advanced Topics in Types and Programming Languages can be used in the classroom and as a resource for professionals. Most chapters include exercises, ranging in difficulty from quick comprehension checks to challenging extensions, many with solutions.

For undergraduate students in Computer Science and Computer Programming courses. Now in its Tenth Edition, Concepts of Programming Languages introduces students to the main constructs of contemporary programming languages and provides the tools needed to critically evaluate existing and future programming languages. Readers gain a solid foundation for understanding the fundamental concepts of programming languages through the author's presentation of design issues for various language constructs, the examination of the design choices for these constructs in some of the most common languages, and critical comparison of the design alternatives. In addition, Sebesta strives to prepare the reader for the study of compiler design by providing an in-depth discussion of programming language structures, presenting a formal method of describing syntax, and introducing approaches to lexical and syntactic analysis.

A comprehensive undergraduate text-

book covering both theory and practical design issues, with an emphasis on object-oriented languages.
This book – composed of two volumes – explores the syntactical constructs of the most common programming languages, and sheds a mathematical light on their semantics, providing also an accurate presentation of the material aspects that interfere with coding. Concepts and Semantics of Programming Languages 2 presents an original semantic model, collectively taking into account all of the constructs and operations of modules and classes: visibility, import, export, delayed definitions, parameterization by types and values, extensions, etc. The model serves for the study of Ada and OCaml modules, as well as C header files. It can be deployed to model object and class features, and is thus used to describe Java, C++, OCaml and Python classes. This book is intended not only for computer science students and teachers but also seasoned programmers, who will find a guide to reading reference manuals and the foundations of program verification.