

Computer Science Resources

Written by Volunteers

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The List order isn't important. I used numbers to make it easier for you to find each topic. for example DSA is listed Before C , but it is better to learn both of them with **each other**.

Important Notes :

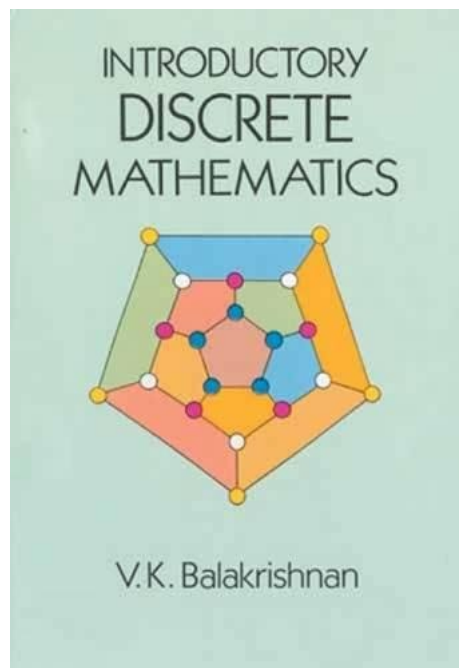
Mathematics especially ***Discrete Mathematics***¹ is a **must** for every Software Engineer. So you must have enough knowledge to solve *complex problems* in Software Engineering.

Always find *every book's* ***Errata***² that *you want to read* , via the *Internet*.

This books are popular for ***Discrete Mathematics*** :

Discrete Mathematics and Its Applications written by *Kenneth H. Rosen* is a good book for learning Discrete Mathematics , but it's a **time-consuming** process to read this book.

You can read *Introductory Discrete Mathematics* , a book which is written by *V.K Balakrishnan* that is a good starting point for **full beginners** in Discrete Mathematics.



¹A branch of Mathematics that studies discrete structures such as Integers , Graphs and statements in Logic

²A list of errors in a printed work discovered after printing and shown with corrections

Recommendation :

I *recommend* you to read these books to learn *Discrete Mathematics* :

1. Elements of Discrete Mathematics , *Chung Laung Liu*
2. Discrete Mathematics with Applications , *Susanna S.Epp*

Mathematics for Computer Science by MIT OCW is a good course , that also provides a practical *reading material*.

Mathematics : A Discrete Introduction is another *efficient* book.

Also , i *recommend* you to read these books for ***Linear Algebra*** :

1. Introduction to Linear Algebra , *Gilbert Strang*
2. Linear Algebra Done Right , *Sheldon Axler*
3. Linear Algebra Done Wrong , *Sergei Treil*
4. Finite Dimensional Vector Spaces , *Paul Halmos*
5. Linear Algebra Problem Book , *Paul Halmos*
6. Advanced Linear Algebra , *Steven Roman*

The *Linear Algebra step by step* is another good book for this field.

For ***Calculus*** , i think these books are *efficient* :

1. Calculus of one Variable , *Joseph W. Kitchen*
2. Calculus , Volume 1 , *Tom M.Apostol*
3. Calculus , Volume 2 , *Tom M.Apostol*
4. Calculus , *Spivack*

I *recommend* you to *supplement* them with *these* courses :

1. *Single Variable Calculus*
2. *Multivariable Calculus with Theory*

Or you can try any other course that is *related* to this subject.

Finally for ***Probablility & Statistics*** read these books :

1. Introduction to Probability , *Blitzstein and Hwang*
2. Introduction to Probability, *Bertsekas and Tsitsiklis*
3. *Introduction to Probability, Statistics, and Random Processes*
4. The Art of Probability , *Richard W. Hamming*
5. An Introduction to Probability Theory and Its Applications, *Vol 1*
6. An Introduction to Probability Theory and Its Applications, *Vol 2*

Important Notes :

The Art of Probability , can be used as a supplement for the *first 3 books*.

The *last 2 books* **are not easy to read** for *beginners*.

These books are *specialized* for ***Statistics*** :

1. *All of Statistics : A Concise Course in Statistical Inference*
2. Theoretical Statistics , *D.R. Cox and D.V. Hinkley*

Additional Resources :

1. [*3Blue1Brown*](#)
2. [*Mathematics for Machine Learning Specialization*](#)
3. *Concrete Mathematics*

1 Introduction to Computer Science

[CS50](#) , harvard university course (*week 1-6*)

this course is an introductory course to computer science.

2 Python 3 *Basics*

Python [for Everybody](#) and [Data structures](#) , Edx

these 2 courses are good resources for learning Python 3 for beginners.

Python Crash Course , Nostarch Press

3 Data Structures and Algorithms (DSA)

Grokking Algorithms

This is a well written book for beginners. it covers the most useful *Data Structures* and *Algorithms* , but it has its own **limits**.

Princeton and Stanford Courses

1. Algorithms , [Part I](#)
2. Algorithms , Design and Analysis [Part 1](#)
3. Algorithms , Design and Analysis [Part 2](#)
4. Algorithms , [part 2](#)

Introduction to Algorithms (Reference)

The Algorithms Design Manual (Optional)

After learning the concepts , read *Algorithms in C* by Robert Sedgewick or any other book (*The Algorithm Design Manual* , ...) for **implementing** Algorithms in C.

4 C Programming Language

C Programming : A Modern Approach

An excellent book for Beginners.

Pointers on C

Another excellent C programming book that is very helpful for everyone who wants to learn **C pointers**.

C Programming Language (K&R)

A classic book written by Dennis Ritchie and Brian Kernighan.

C in a Nutshell

A great book for Modern C. you can also check **modern C** book that is written by *jens Gustedt*.

5 Theory of Computation

** Michael Sipser and Dexter C.Kozen **

Introduction to the Theory of Computation (Michael Sipser)

Automata and Computability (Dexter C.kozen)

Reading these two books , give you a complete understanding. You can also check other resources like **stanford** course and **Cindrella Book**.

** Additional Resources **

[Automata Theory](#) , Stanford university Course

Introduction to Automata Theory , Language , and Computation (1st and 2nd Edition) (Reference)

most of the readers of this book said that the *3rd Edition* doesn't have the helpful exercises that was present in the *1st and 2nd Editions*.

6 Compilers

** introduction **

[Compilers](#) , Stanford university Course

** Concepts **

Compilers : Principles , Techniques and Tools (2nd Edition)

Also known as *Purple Dragon Book* , it is the **most recent** Book for Compilers written by Aho. But some concepts are better explained in *Red* and *Green Dragon* Books.

Compilers : principles , Techniques and Tools (*Red Dragon Book*) (Reference)

Principles of Compiler Design (Green Dragon Book) (Reference)

** Implementation **

[Compiler Design in C](#) (Allen Holub)

Brinch hansen on pascal compilers

7 Digital Logic / Digital Design

Digital Design and Computer Architecture by Harris & Harris

Digital Circuits and Design by S. Salivahanan & S. Arivazhagan

Digital Design Principles and Practices (*Reference*)

8 Computer Architecture

** Books **

Computer Organization and Design : The Hardware/Software Interface

Computer Architecture : A Quantitative Approach

** Courses **

[Computer Architecture](#) , Princeton university course

Onur Mutlu Lectures

*** *Additional* ***

Structured Computer Organization by Andrew Tanenbaum & Todd Austin

This book is recommended to *beginners*.

The university of *Wisconsin-Madison* recommendation

<http://pages.cs.wisc.edu/~arch/www/books.html>

9 Operating Systems

*** *Concepts* ***

Operating System Concepts

Modern Operating Systems (Reference)

*** *Examples* ***

The Design of Unix Operating System by Maurice Bach

You can also read [How Linux Works : What Every Superuser Should Know](#) or any other book about this subject.

*** *Implementation* ***

Operating Systems : Design and Implementation

10 Shell Scripting

The Linux Command Line

Unix and Linux System Administration Handbook (4th & 5th Edition) (Reference)

Some concepts aren't covered in the *5th* Edition (Latest Edition) , but covered in the *4th Edition*.

11 Computer Networking (*Basics*)

* *Introduction* *

[Introduction to Networking](#) , NYU course

* *Concepts* *

Computer Networks by Andrew S. Tanenbaum

TCP/IP Illustrated Vol. 1 : The Protocols by *W. Stevens* (1st Edition)

The **2nd** Edition of TCP/IP Illustrated vol 1 isn't *Ideal* for **Beginners** and Consists of many *Mistakes*. So the **1st** Edition is better for this purpose.

12 Game Theory

* *Introduction* *

A Brief Introduction to the basics of Game Theory

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1968579

* *Courses* *

[Game Theory](#) , Stanford university course

[Welcome to Game Theory](#) , Tokyo university course

[Algorithmic Game Theory](#) , Tim Roughgarden (*fall 2013*)

* *Books* *

Twenty Lectures on Algorithmic Game Theory

Algorithmic Game Theory

<https://www.cs.cmu.edu/~sandholm/cs15-892F13/algorithmic-game-theory.pdf>

Multiagent Systems

<http://www.masfoundations.org>

These resources don't have special **prerequisites** except a basic knowledge in :

Probability , *Calculus* , *Algorithms*

13 Additional Resources

** Programming **

Structure and Interpretation of Computer Programs ([SICP](#))

An *Introduction* to Programming for **Experts**.

Standard C Library

Advanced Programming in the UNIX Environment, 3rd Edition by W. Stevens and Stephen Rago

** Computer Networking **

The TCP/IP Guide : A Comprehensive , Illustrated Internet Protocols Reference (**Reference**)

It is a good book as a *Reference* , but the Implementations aren't useful nowadays , because the book was published in **2005**.

TCP/IP Illustrated, Vol. 2 : The Implementation (**Reference**)

Another good book for studying *Computer Networking* , it is outdated (**Published 1995**) but explains concepts very well.

Good Luck