بسم الله الرحمن الرحيم

CSE 1101 : Structured Programming Language

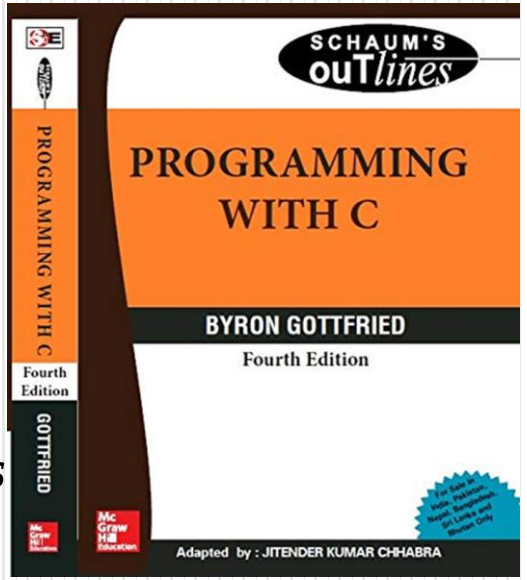
Engr. Md. Mamun Hossain

B.Sc. (Engg.) & M.Sc. (Thesis) in CSE, SUST; PhD(Pursuing), RUET.

Associate Professor, Dept. of Computer Science & Engineering,
Bangladesh Army University of Science & Technology (BAUST).

Introduction to C and Basics

- *Overview of C programming language*
  - *What is C?*
  - *Why Learn C?*
  - *History of C*
  - *C and C++*
- *Setting up the dev. environment (IDEs, compilers)*
- *Writing and running a simple C program*
- *C Syntax, Statements, Escape Sequences and Comments*
- *Compiler versus Interpreter*

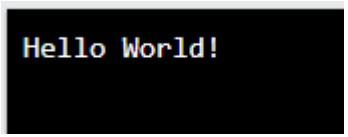


What is C?

- C is a general-purpose, procedural programming language that was developed in the early 1970s by Dennis Ritchie at Bell Labs.

- It is one of the most widely used programming languages and has influenced many other languages, including C++, C#, and Objective-C.

An Example C Program:
It prints " Hello World!" in standard output device (on the screen)



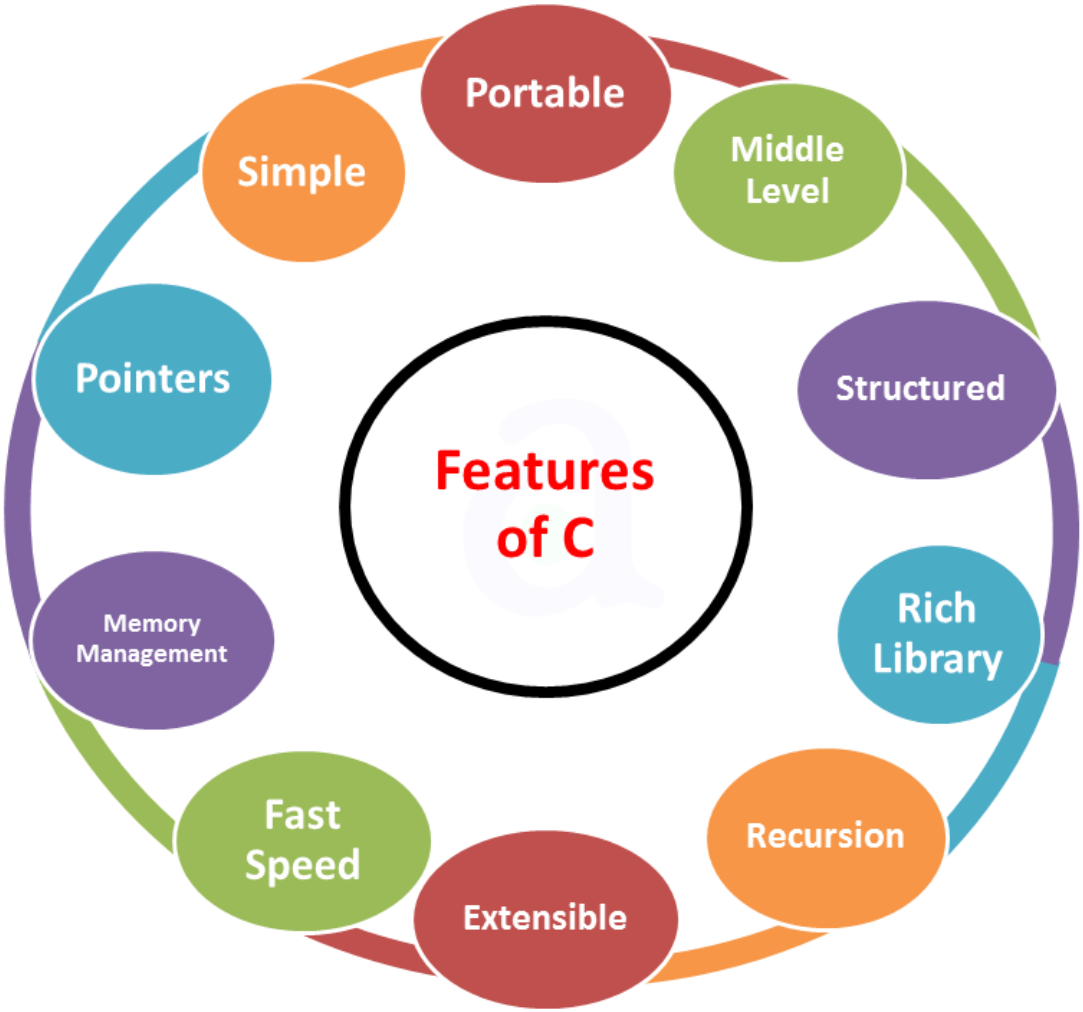

```c
#include <stdio.h>

int main() {
  printf("Hello World!");
  return 0;
}
```

Why Learn C?

- It is one of the most popular programming language in the world
- If you know C, you will have no problem learning other popular programming languages such as Java, PHP, Python, C++, C#, etc, as the syntax is similar
- C is very fast, compared to other programming languages, like Java and Python
- C is very versatile; it can be used in both applications and technologies

Features of C



C can't be used for internet programming like Java, .Net, PHP, etc.

Features of C

C programming is considered as the base for other modern programming languages, that is why it is known as mother language.

- **Mother language**
  - most of the compilers, JVMs, Kernels, etc. are written in C language, and most of the programming languages follow C syntax, for example, C++, Java, C#, etc.
- **System programming language**
  - C language is a system programming language because it can be used to do low-level programming (for example driver and kernel). It is generally used to create hardware devices, OS, drivers, kernels, etc. For example, Linux kernel is written in C.
- **Procedure-oriented programming language**
- **Structured programming language**
- **Mid-level programming language**

Features of C

- **Procedure-oriented programming language**
  - A procedure is known as a function, method, routine, subroutine, etc. A procedural language specifies a series of steps for the program to solve the problem. A procedural language breaks the program into functions, data structures, etc.
- **Structured programming language**
  - A structured programming language is a subset of the procedural language. Structure means to break a program into parts or blocks. C language can break the program into parts using functions. It makes the program easier to understand and modify.
- **Mid-level programming language**
  - C is considered as a middle-level language because it supports the feature of both low-level and high-level languages. C language program is converted into assembly code, it supports pointer arithmetic (low-level), but it is machine independent (a feature of high-level).

Features of C

- **Mid-level programming language**

  - A ***Low-level*** language is specific to one machine, i.e., machine dependent. It is machine dependent, fast to run. Programs written in low-level languages tend to be more efficient in terms of execution speed and memory usage. But it is not easy to understand. Assembly languages and machine languages are classic examples of low-level languages.

  - A ***High-Level*** language is not specific to one machine, i.e., machine independent. It is easy to understand and portable. Python, Java, C++, and JavaScript are examples of high-level programming languages.

In practice, many modern software projects involve a combination of both low-level and high-level languages, with low-level languages used for performance-critical components and high-level languages for rapid development and maintainability.

History of C

The history of the C programming language dates back to the early 1970s. Here's a brief timeline

- **Origins (1969-1972)**
  - C was developed at Bell Labs (AT&T's Bell Telephone Laboratories) by Dennis Ritchie and Ken Thompson.
  - It evolved from an earlier language called B, which was also developed at Bell Labs.
  - Ken Thompson and Dennis Ritchie began working on C in 1971, with the intention of improving the B language.

History of C (Cont.)

- **Development and Standardization (1972-1989):**
  - In 1972, the first version of the C language was implemented.
  - The development of C continued, and it quickly gained popularity due to its flexibility and efficiency.
  - Dennis Ritchie published "The C Programming Language" book in 1978, which became a widely used reference for C programmers.
  - The American National Standards Institute (ANSI) formed a committee in 1983 to establish a standard definition for the C language.
  - The ANSI C standard, known as C89 or ANSI C, was formalized in 1989.

History of C

- **International Standardization (1989-Present):**
  - The International Organization for Standardization (ISO) adopted the ANSI C standard, leading to the publication of the ISO C standard (ISO/IEC 9899:1990).
  - The C standard has since been revised and updated. The most notable revisions include the C99 standard (published in 1999) and the C11 standard (published in 2011).
  - These standards introduced new features and improvements to the language.

History of C (Cont.)

- **Legacy and Influence:**
  - C has had a profound impact on the field of computer science and programming languages.
  - It influenced the development of many other programming languages, such as C++, Objective-C, and C#.
  - C remains a popular choice for system programming, embedded systems, and various applications requiring low-level access to computer resources.
  - Ken Thompson and Dennis Ritchie began working on C in 1971, with the intention of improving the B language.

Despite being over five decades old, C continues to be relevant due to its efficiency, simplicity, and the fact that it provides a level of abstraction close to the hardware, making it suitable for a wide range of applications.

C and C++

- C++ was developed as an extension of C, and both languages have almost the same syntax
- The main difference between C and C++ is that C++ support classes and objects, while C does not

```c
#include <stdio.h>

int main() {
  printf("Hello World!");
  return 0;
}
```

Hello World C Program

```cpp
#include <iostream>
using namespace std;

int main() {
  cout << "Hello World!";
  return 0;
}
```

Hello World C++ Program

C and C++

- C is a general-purpose, procedural programming language that was developed in the early 1970s by Dennis Ritchie at Bell Labs.

- It is one of the most widely used programming languages and has influenced many other languages, including C++, C#, and Objective-C.

C and Legacies – A brief

Language	Inventor	Time	Place	Legacy
C	Dennis Ritchie	1972	Bell Labs	Foundation for many operating systems and applications
C++	Bjarne Stroustrup	1979	Bell Labs	Object-oriented extension of the C language, widely used in software development
MATLAB	Cleve Moler	1984	University of New Mexico	Numerical computing, widely used in engineering, science, and finance
Java (Oak)	James Gosling	1995 (1989)	Sun Microsystems	Platform independence, used in Desktop Application,web development, mobile applications, and more
Python	Guido van Rossum	1991	Centrum Wiskunde & Informatica	Readability, versatility, widely used in web development, data science, and artificial intelligence
R	Ross Ihaka, Robert Gentleman	1993	University of Auckland	Statistical computing and graphics, widely used in data analysis and research
PHP	Rasmus Lerdorf	1995	Personal Home Page Tools	Server-side scripting, widely used in web development and dynamic content creation

What is Programming?

- The process or activity of writing computer programs.
- **Programming** is a way to "instruct the computer to perform various tasks"
- A computer **program** consists of code that is executed on a computer to perform particular tasks. This code is written by **programmers**.
- A complex programming may involve **data structures** and **algorithms**

Program & Programming

What is Program ?

Program is a set of instruction that a machine follows.

What is Programming?

Programming is to make machine work.
Programming creates instruction set that a machine follows.

Why Programming?

- Simple because it is your number **#1 weapon** to fight against the thread on the journey to reach your **dreamed destiny**(***become a successful CSE Graduate, a Computer Engineer***)
- This is the foundation to most other vital courses like C++, Data Structure, Algorithms, Machine Learning etc.
- Computer programming is a fundamental skill for so many different applications, not just software development or cutting-edge research
- It Guarantees You a Job!

Am I be an Expert Programmer?

আমি কি প্রোগ্রামার - *Programmer* হতে পারব ???

Am I be an Expert Programmer?

Certainly!!!

নিশ্চয় !!!

তুমিই পারবেই

Am I be an Expert Programmer?

ভাল প্রোগ্রামার হতে হলে আমাকে কি করতে হবে?

Am I be an Expert Programmer?

ভাল ক্রিকেটার হতে হলে তোমাকে কি করতে হয়?

Am I be an Expert Programmer?

Practice!!!

Am I be an Expert Programmer?

ভাল প্রোগ্রামার হতে হলে তোমাকে করতে হবে বেশি বেশি

Practice

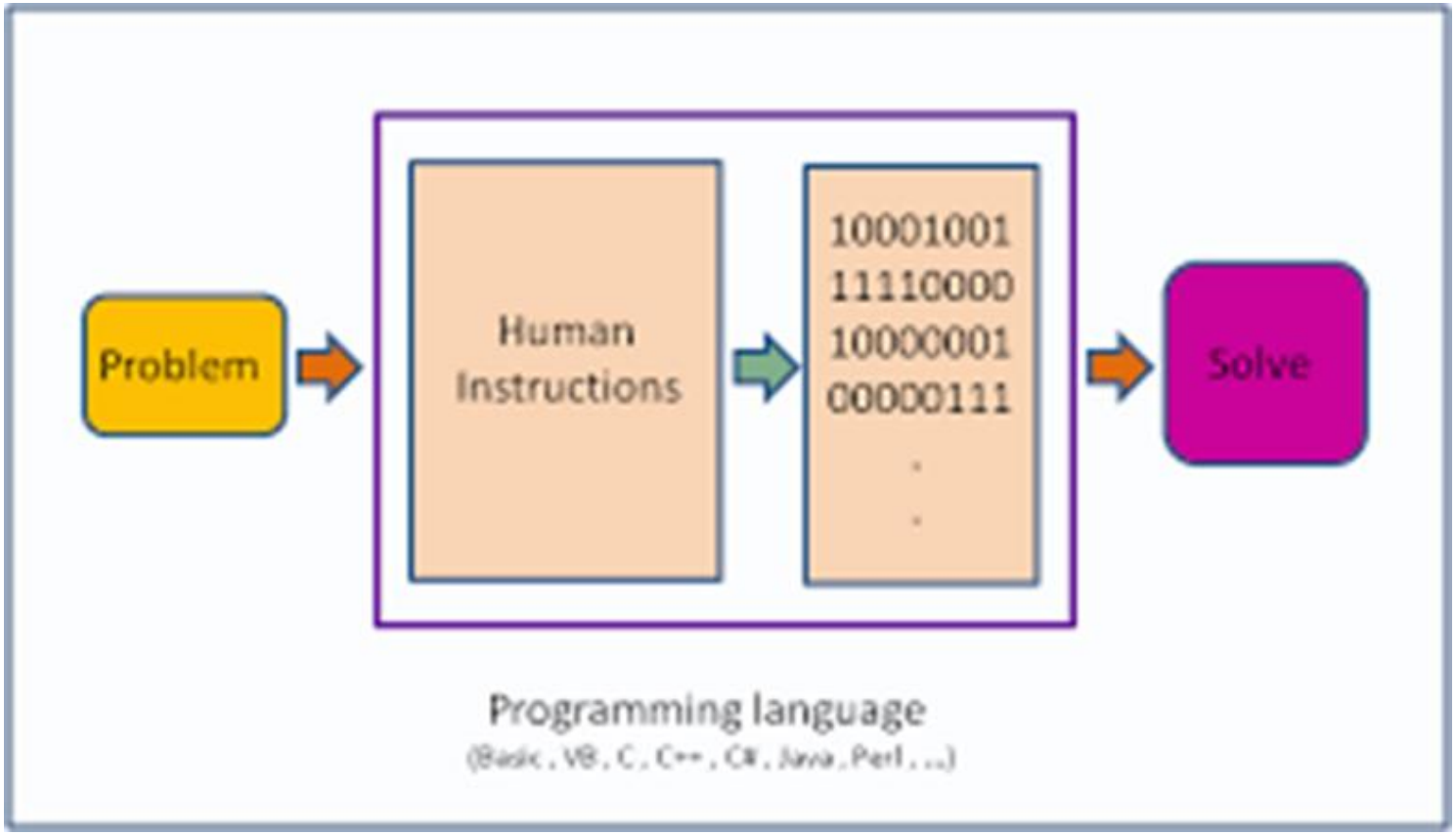
Coding Habit

To be Exact

Am I be an Expert Programmer?

Programming,
Programming,
And Programming…

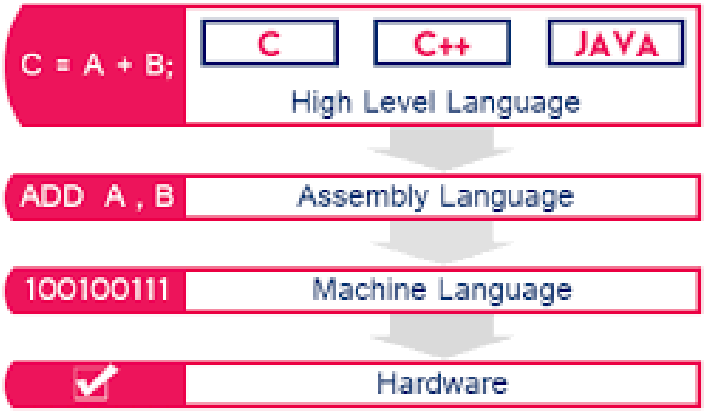
Why is Programming Language?



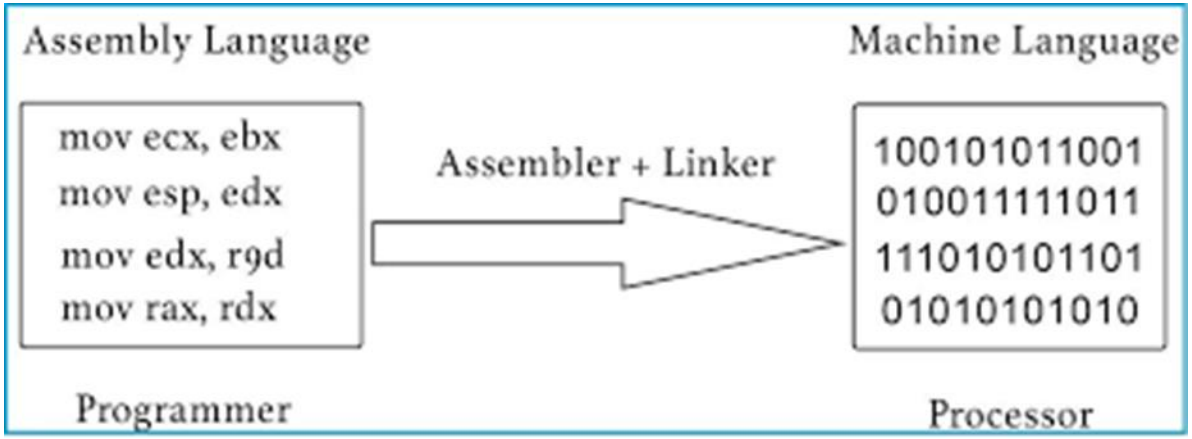
Programming Languages

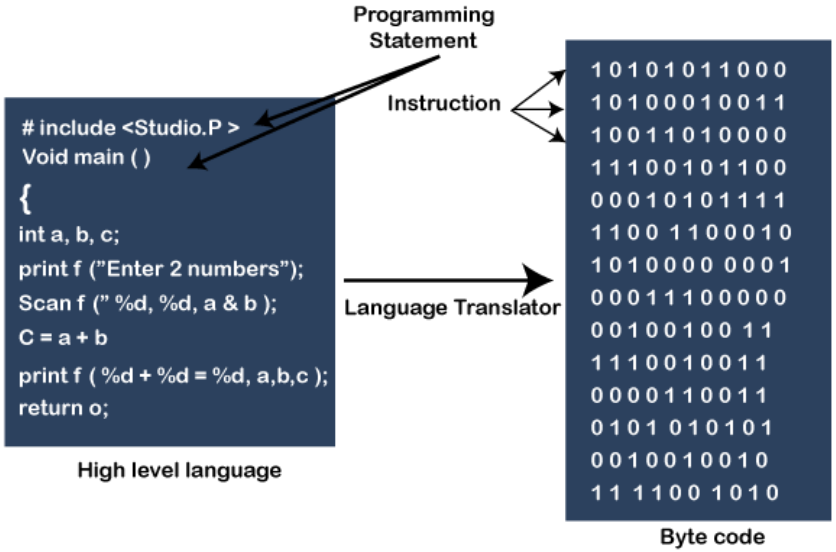
There are three main kinds of programming language:

- **Machine language**
  - it's the language of machines, consisting of bits (1s and 0s)
- **Assembly language**
  - a little easier than machine language, but not much! It uses more convenient numbers, symbols and abbreviations
- **High-level language**
  - Human readable instructions sets

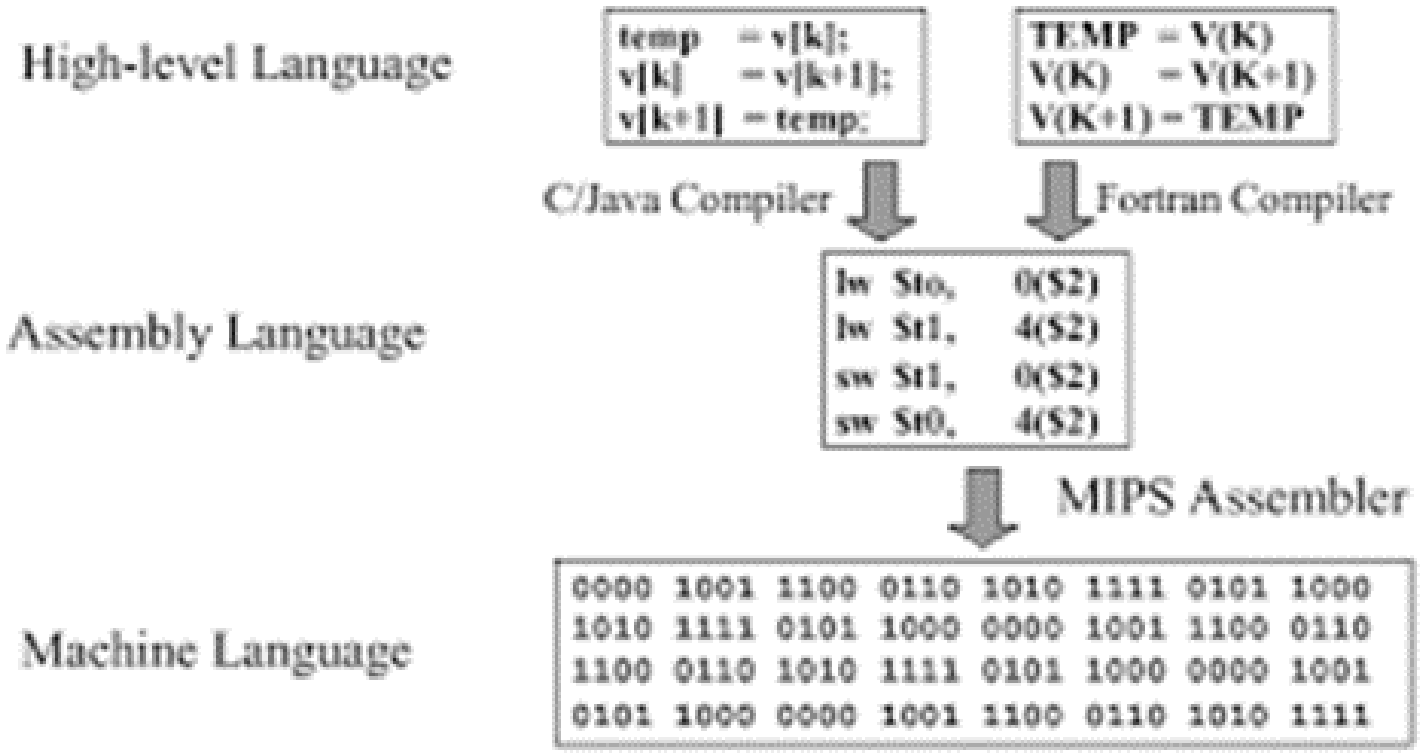


Programming Languages



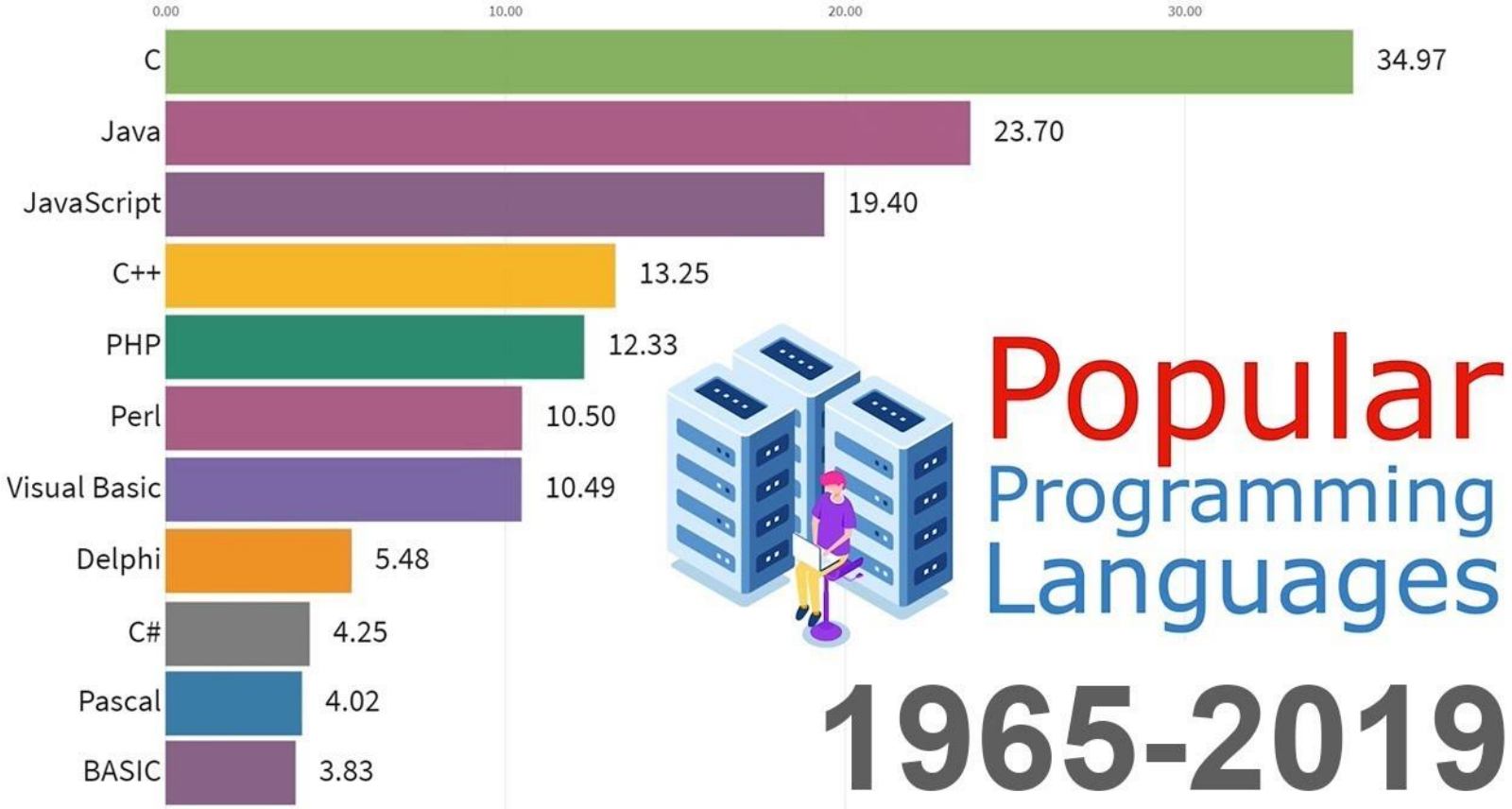


Programming Languages

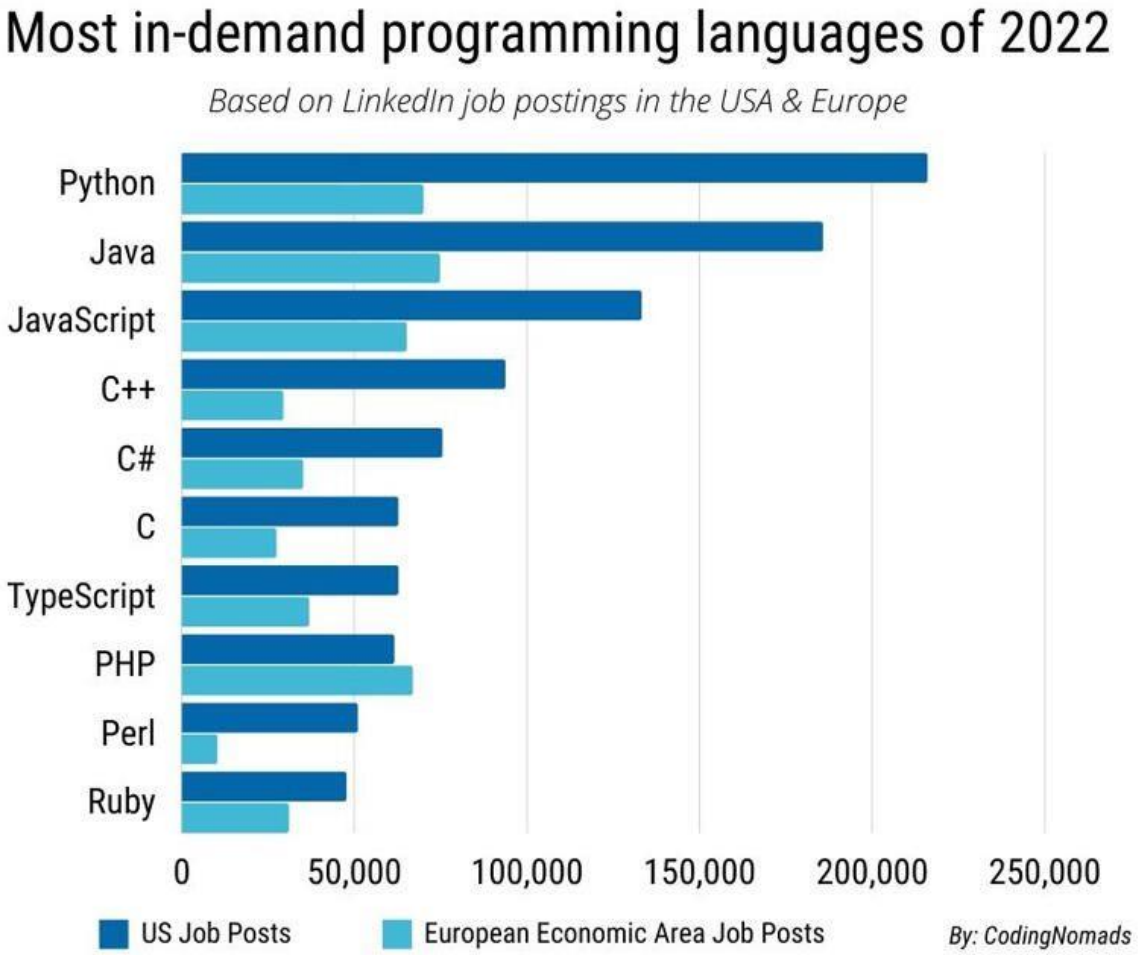


Programming Languages

Popular Programming Languages



Popular Programming Languages



Popular Programming Languages

Which Language, Where?

Language	Related Courses	Inventor	Invented	Level/Term
C	**POP**, OS, databases, compilers	Dennis Ritchie	1970	**1-I**
C++	**OOP**, Data Structure & Algorithm, OS	Bjarne Stroustrup	1979	**1-II, 2I**
Java/C#	**OOP** II, Project Work I & II	James Gosling	1991/95	**2-II**
PHP,(HTML, CSS, ***JavaScript***)	**Web Development** Project, Android Apps Development	Rasmus Lerdorf	1994/95	**3-1**
MathLab/ (Python**)**	Numerical Analysis	Stephen C. Johnson	1990	**3-II**
Python/R	AI, Machine Learning, Data Mining	Guido Van Rossam , R & R	1991, 1991/93	**4I, 4II**
Kotlin	Android App Development	**JetBrains**	2016	**Projects**
Swift	iOS, iPadOS, macOS, tvOS, and watchOS	**Chris Lattner (**Apple)	2010	**Projects**

Fundamental Component of POP/ SPL

- Keywords, Data Type, Variables
- Operators
- **Control Statements – Looping, Branching**
- **Function**
- **Array**
- ***Pointer***
- String
- ***Recursion***
- File- IO
- **Structure**, Union
- OOP – C++/Java (Next…)

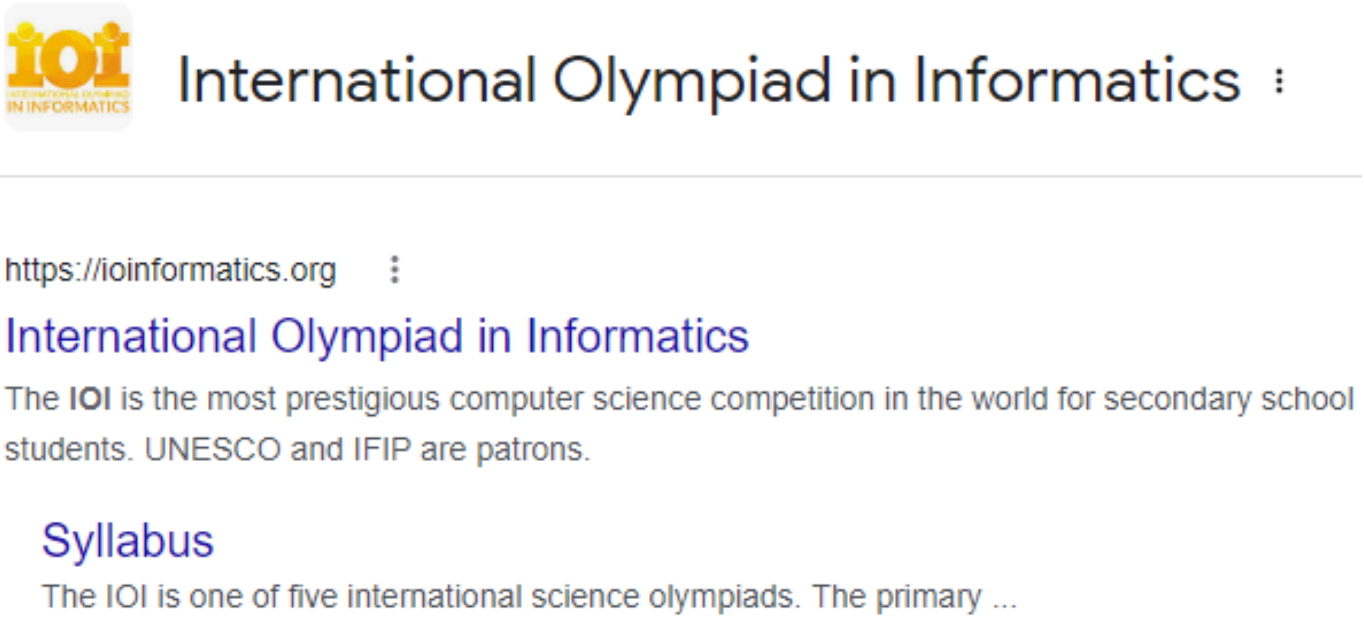
Useful links

- https://www.w3schools.com/ -learning coding online
- https://www.geeksforgeeks.org/ - A Computer Science portal for **geeks**
- https://www.programmingsimplified.com/c - To quickly learn C language
- https://www.javatpoint.com/ - Free Online Tutorials
- https://www.tutorialspoint.com/ - Free Online Tutorials
- https://dimikcomputing.com/ - বাংলা ভাষায় প্রোগ্রামিং সংক্রান্ত কোর্স
- http://cpbook.subeen.com/- বাংলা ভাষায় কম্পিউটার প্রোগ্রামিং শেখার বই
- https://stackoverflow.com/ - a question and answer website
- http://shikkhok.com -
- https://hsa.grecbd.com/
- https://app.kodezi.com/

Programming Contest

প্রোগ্রামিং প্রতিযোগিতা

- স্কুল-কলেজের ছাত্রছাত্রীদের জন্য সবচেয়ে বড় প্রতিযোগিতা হচ্ছে আইওআই (IOI– International Olympiad in Informatics)। 1989 সাল থেকে প্রতিবছর এ প্রতিযোগিতা অনুষ্ঠিত হচ্ছে। একেক বছর একেক দেশে প্রতিযোগিতা অনুষ্ঠিত হয়।



Programming Contest

প্রোগ্রামিং প্রতিযোগিতা

- বিশ্ববিদ্যালয় পর্যায়ের ছাত্রছাত্রীদের জন্য সবচেয়ে বড় প্রোগ্রামিং প্রতিযোগিতা হচ্ছে এসিএম আইসিপিসি (ACM ICPC– ACM International Collegiate Programming Contest)। 1998 সালের পর থেকে প্রতি বছরই বাংলাদেশ থেকে কমপক্ষে একটি দল চূড়ান্ত পর্বে অংশগ্রহণের যোগ্যতা লাভ করে।
- http://en.wikipedia.org/wiki/ACM_ICPC_Dhaka_Site।

International Collegiate Programming Contest

https://icpc.global

The ICPC International Collegiate Programming Contest

The International Collegiate **Programming Contest** is an algorithmic **programming contest** for college students. Teams of three, representing their university, work ...

Past Problems

Update in progress. 2020 ICPC World Finals. Problems; [Input ...

Programming Contest

প্রোগ্রামিং প্রতিযোগিতা

- এছাড়া ইন্টারনেটে অনুষ্ঠিত হয় আরও নানা ধরনের প্রোগ্রামিং প্রতিযোগিতা যেখানে স্কুল-কলেজ-বিশ্ববিদ্যালয়ের ছাত্র, শিক্ষক ও পেশাজীবীরা অংশগ্রহণ করতে পারেন। এদের মধ্যে গুরুত্বপূর্ণ তিনটি হচ্ছে
  - ***Google Code Jam*** (http://code.google.com/codejam),
  - ***Topcoder*** *(http://www.topcoder.com/tc)* এবং
  - ***Codechef*** (http://www.codechef.com/)।

এই প্রতিযোগিতাগুলো অত্যন্ত কঠিন, তাই এতে অংশগ্রহণের জন্য পর্যাপ্ত দক্ষতা থাকতে হবে। তবে এসব প্রতিযোগিতায় কিন্তু বাংলাদেশের প্রোগ্রামাররা বেশ ভালো অবস্থানে রয়েছে।

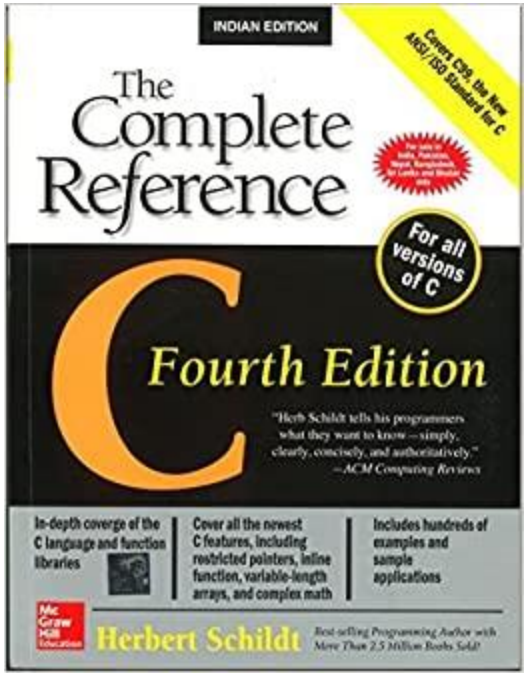
Programming Contest

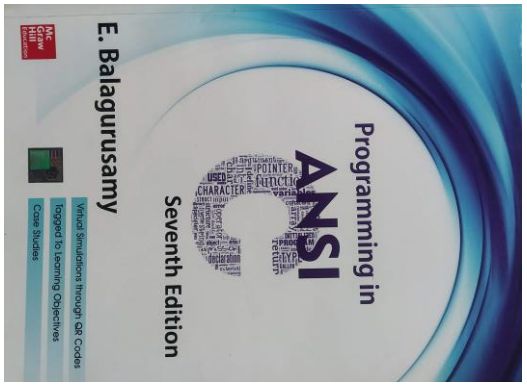
প্রোগ্রামিং প্রতিযোগিতার জন্য কিছু লিংক:

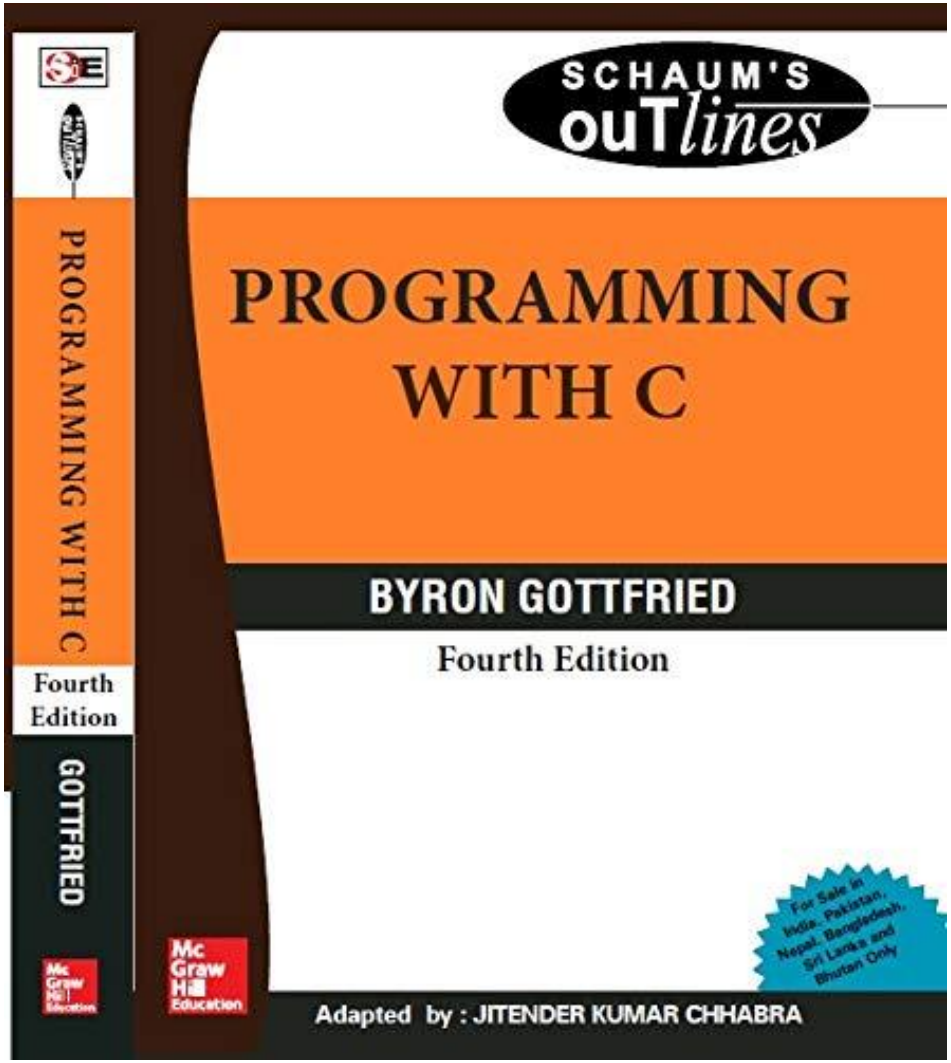
- http://uva.onlinejudge.org/ এই সাইটে নিয়মিত অনলাইন প্রোগ্রামিং প্রতিযোগিতার আয়োজন করা হয়। এ ছাড়াও অনুশীলনের জন্য প্রচুর সমস্যা দেওয়া আছে। ***নতুন প্রোগ্রামারদের*** জন্য এটি বেশ ভালো
- http://www.topcoder.com/tc এখানেও নিয়মিত অনলাইন প্রোগ্রামিং প্রতিযোগিতা অনুষ্ঠিত হয়। এখানে ভালো ফলাফল করলে আবার টাকাও দেয় (কী আনন্দ!)। এ ছাড়া এখানে অনেক ভালো টিউটোরিয়াল ও আর্টিকেল আছে। এটি অভিজ্ঞ প্রোগ্রামারদের জন্য বেশ ভালো সাইট।
- http://codeforces.com এই সাইটে নিয়মিত বিভিন্ন ধরনের প্রোগ্রামিং কন্টেস্ট হয়। অভিজ্ঞ প্রোগ্রামারদের জন্য ভালো।
- http://www.codechef.com এটিও প্রোগ্রামিং প্রতিযোগিতার জন্য একটি ভালো ওয়েবসাইট এবং অভিজ্ঞ প্রোগ্রামারদের জন্য।

প্রোগ্রামিং ছাড়াও বিজ্ঞান ও গণিতের নানা বিষয়ের জন্য এই ফোরামে অংশগ্রহণ করতে পারো: http://matholympiad.org.bd/forum/ ।

Book Reference







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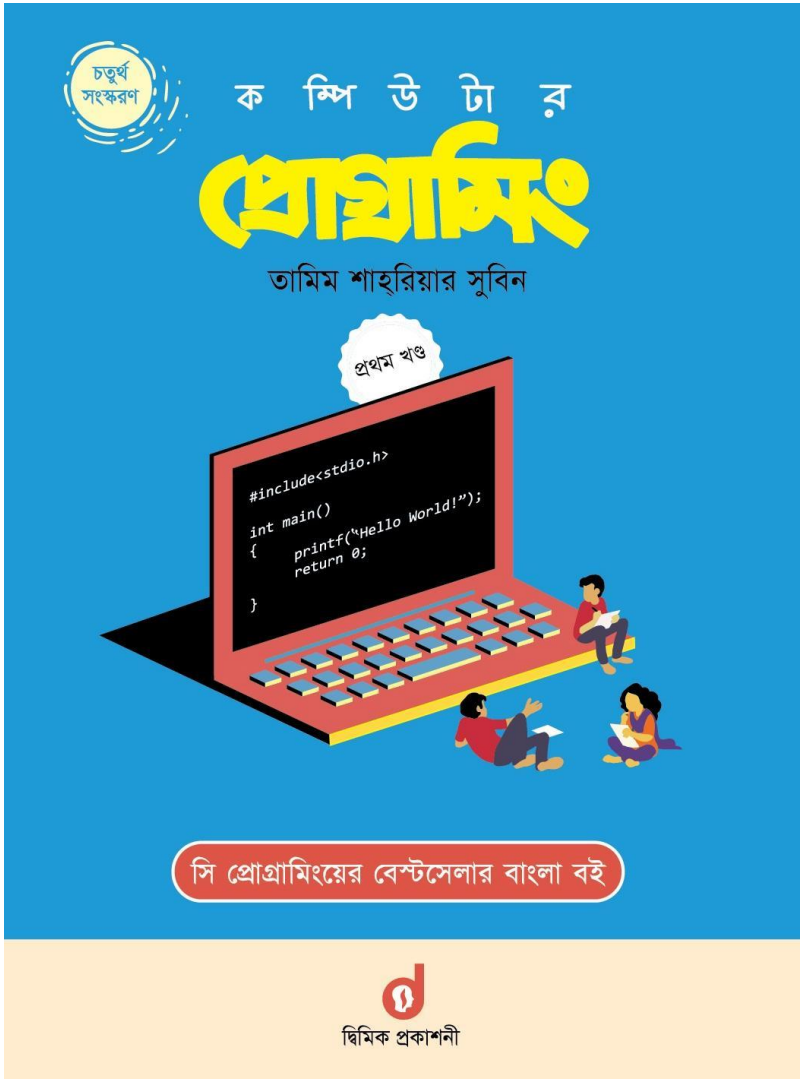

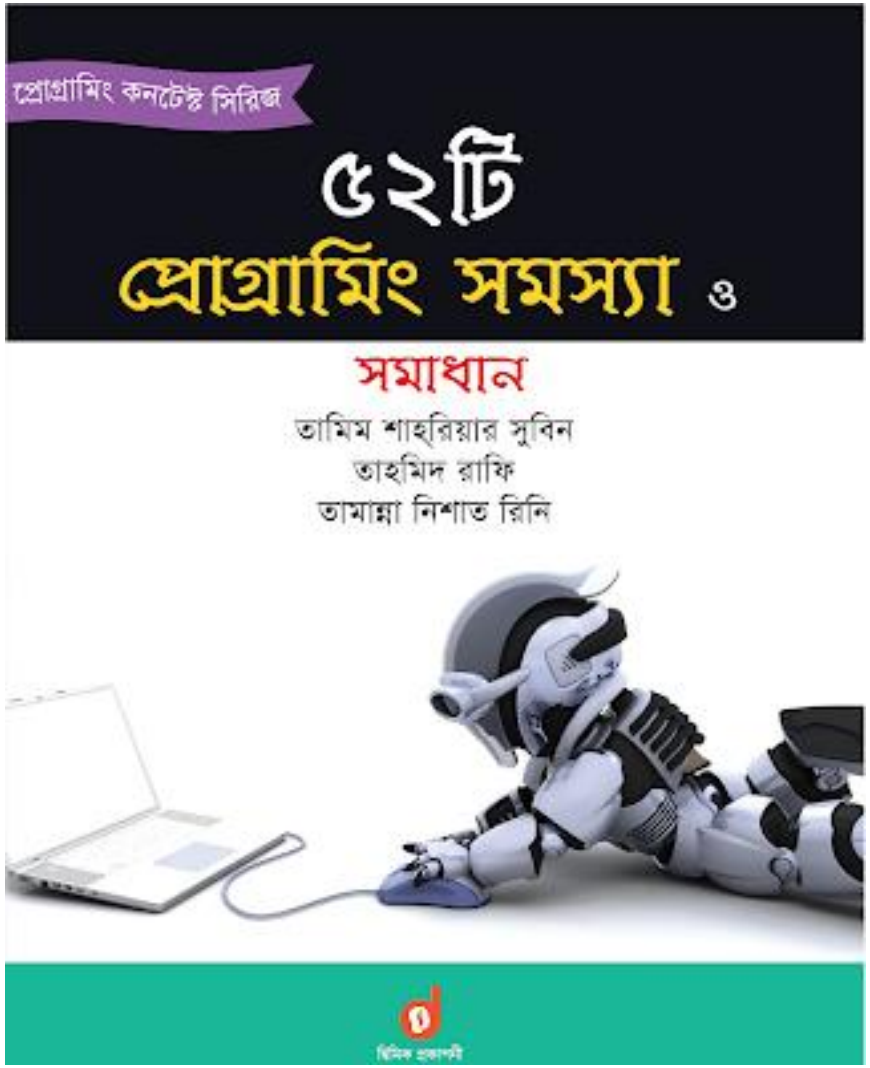

Hands on Session

Hello World Program in C Language:

C

```c
#include <stdio.h>

int main() {
   printf("Hello World");
   return 0;
}
```

Hello World Program in C++:

C++

```cpp
#include <iostream>

int main() {
    std::cout << "Hello World";
    return 0;
}
```

Hello World in C#:

C#

```
namespace HelloWorld
{
    class Hello {
        static void Main(str
        {
            System.Console.W
        }
    }
}
```

Hello World in Ruby:

Ruby

```ruby
puts 'Hello World'
```

Hello World in Python:

Python3

```
print("Hello World")
```

Hello World Program in Matlab:

```
disp('Hello World');
```

Hello World Program in R:

R

```
cat('Hello World')
```

Hands on Session


```c
#include <stdio.h>
int main()
   {
    int x, y, sum;
    printf("\nInput the first integer: ");
    scanf("%d", &x);
    printf("\nInput the second integer: ");
    scanf("%d", &y);
    sum = x + y;
    printf("\nSum of the above two integers = %d\n", sum);
    return 0;
}
```

```
Sum of two integers : 25 + 38 = 63
```

Thank You!

For your patience hearing!